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(S4) POWDERED MEDICATION DIHALER INHALATOR FÜR PALVERARTIGES MEDDKAMENT

DHALATEUR DE MEDICAMENTS SOUS FORME DE POUDRE

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EP 0 883 415 B1

[DO15] In accordance with an expect of the present invention, a powder dispenser includes a supply for holdes dependent of infection benchesq to players and inheletion control extending in a first direction and porrying a predotermined amount of said powdered metarial from said apply to said inhabition conduit, and a nazzia for raducing particle stres of agglomerates of provident contains from the intelligion conduit to form micronized powdered material and for mixing exist micrunized powdered memorial with suction air, said nazzle including a cowly for charging the direction of flow of eald courter from said first election of eald inhalation conduit to a second direction different from said first direction, said cavity being defined by a top wall and a - Cl aids connected to a periphery of said top well, anid top wall having an exercise thereign a said wall for exhibitor Daily continuously changing the direction of flow of the powder in the excend direction in the centry; and a chimney extending from the top self in corresponding relation to the opening for changing the direction of flow of the cowder from the second direction of the capity substandaily back to the first direction, the chimney extending stong an extel deaction thereof and including an issuer har wall surface leaving inequisities according in the estal direction providing estably estanding estimates against which agglomerates exting the swirl means can

[0016] Protective, the inequirities are formed by a plurality of flucies on the inner bibuler well purison, and the factor are founded by a plurally of first concease wall actions extending in the axial drection and having an and of a liver regular in- a direction transverse to the arrival direction, and a plurality of second scall sections extending in the exist direction and inseconnecting the first conceive well sections, the second well sections being of a concave configuration having an art of a second madium in a direction (represente to the social direction, the second radius being greater than the Ord radius.

[0017] The ten walk as a disclar shape and the opening is cantrally located in the top well, and the emit well हें क्षेत्र के क्षेत्र का प्रत्याची करते. क्षेत्र क्षेत्र के क्षेत्र के क्षेत्र के क्षेत्र के क्षेत्र के क्षेत COL THE CONNECT AND EXTENDED IN A SECREPART COLD concerns and being connected with the top well.

(0018) Protectly the powder department includes a 4 for housing for heighing a supply of powdered metacked to be dispursant, the people bousing including an interior contain econoling Description in a first diraction, in displaced relation to the supply of powdered material, the powder toxage lectuding a reservoir body including the execute of possessed stateded and the interbecome control, and a driving body second to the reservoir body for drafting the meanoir body in a rotational direction, the diving tody legisting a plurality of months es in an upper portice thereof, a contenting plate for eachian of inhabitation between the following the first partiers of being plate including a graphral does note for beiding the createred emount of the president contents, the one-

tering plate being positionable below the expply of powdered meterfal, and the metering plate and the powder housing being relatively bi-directorally rotatable with respect to each other about a common certiff ech so sitioned in displaced relation to said supply, means for - \$ - that the matered does have can be placed in fluid communication adjectively with the auxily of powdered mamerial or the inhalation conduit; a spring for binsing the metering plate and the powder housing toward each other; and a nazzle mounted to the driving body for readle ing the metered emount of the powdered material through the inhetation conduit, the nazzte installing the

welfard in the recurses of the citring body. (DOTS) The driving body has a discuser top wall, and the recurses are arranged along a partcheral portion of

the top well along a common circle. At least one of the cesses extends for a different length them enother of the accesses, and the ribe have togethe currespondent to respective once of the recessors. (0000) Protectable the rise and the divine body are

made from a plastic material, and the ribe are ultrasonically weighed in the recesses of the driving body such that the clastic material of the rite in farned into the cite he material of the recessors. DOM: Professing in excitors to the absorptioned

powder disperser including the powder bounky having the reservoir body and the driving body, the metadog plate, and the spring, the driving body includes at least one others recess with a scales (from in each others) mores and the powder despetant better includes an eclapter non-rotatably mounted with respect to the masuring plata, the adapter including at least one locking mones for receiving the at least one studies Depar thereig to prevent retation of the powder housing relative to the adapter and the metering plate; and a closure cap for covering the prouder housing and for printing the prouder dispenser for use, the closure cap including printing the for rotating the pre-der housing such that the inhabitet conduit is in communication with the (natured dose hale when the classics cap is removed trans covering relation of the powder housing and for retaining the powder house any sects that the industrian countril is out of comment cation with the meaned duste hole when the closure CID is excused in country relation to the powder formity. the principality being the at least one spring from our of this at least one locking recess of the adaptar to one ble rations of the powder boundary relative to the creamgrides and the engaging with the at least one othing recess to extend the possessy tourising relative to the me-

wing place. (DOZZ) Specifically, the drawing body leakable two dematrically appeals spring degard, the adapter includes two distributions occurrent todays recessors and the cap includes at least two distractically opposite printing risk. [DOZZ] Each printing its lectudes an upper nimp po-Bon and a lower many portion which medi at an interior data projectivo porton and raduca in distress de Dev prove away from the projecting portion, such that the up-

the time bound prints by the st part to study

EP 0 123 415 B1

INTRODUCTION TO THE INVENTION

Description

(0001) The present everton relation opening to powder diepenser ausentifies aud, more perfortady, is derected to a powder depender assembly used for liviniztion of a metered dose of a powdered medicament. [0002] When delivering medicaments, that is, pharmecologically ective compounds, in solid form to the respiratory tract and to the funce, careful attention to the accuracy of the dossign, which can be smaller than 0.1 miligram, must be made. This is because such medicaments are other quite potent, and the edinistication of expective emounts thereof could be harmful to the padon't. Further, If the doesno that is delivered in too small, I will not serve its purpose.

[DODD] It is also concernery that the particles leaving the dispersor assumbly be substantially within a particare too large may not enter a desired lower portion of the respiratory back, such as the branchiel tree or lungs, but instead will be deposited to the mouth or pheryon and thence enterthe digestive tract. As an example, preterred particles usually are considered as having a d- 21 [DOOS]. Also, positioning of the cap for the routing opemeter has then about 10 micrometers.

[DOD4] Various devices have been used in order to dispense a metered dose of powdered medicament, including pressurized aerosol devices, netrolizing devicon, pump inhabitors and the Dia. With the current concam over environmental issues, however, semect devices, which constitute a large part of the devices now on the market, are less favored. Further, with aerosol devices, the medicament is disasted or suspended in a liquid propeltant instaure, which results in the introduction of unneeded charaked substances into the body and further adds to the complexity of the devices.

(2005) In addition to the aforementioned bross of dispensor exactibles, powder dispersor exactibles are also known. Studies have shown that there are virtually no significant differences in branchodistor responses with explosions amounts of medicinel exhibitation telministered either by powder dispensing devices or eareach devices. Accordingly, there is now an ever-growing demand for powder dispensing devices which can dispense matered doses of powdered medicament. With such devices, the powder is automatically withdrawn during inspiration so there is tess need to be concerned with synctronizing release of medication with the exact estact of inaphration to insure quality of the product deli-

[DODS] One such device has been described in published international Patient Application No. WO \$4/14492, However, It has been discovered that various enhancements thereto are possible and destrable, as will now be described.

(0007) In the first place, when applementes comprised of hard particles are used, for example, having a

traffit density of 0.29 to 0.36 g/ml, in contrast to executed agglomerates having a bulk density of approximately 0.27 g/ml, the respirable fraction, that is, the portion of the particles that can array the lower always, may be less then the which is desirable for exercise executeous have shown that the respirable traction from the powder depender of the aforementioned international applica-Son for a formulation of mometascens/factors applicates ates having a component weight rate of 1:5.8 provides only about 10% of total particles having diameters less

2

then about 8.8 micrometers. It has been determined that one of the likely reasons for this is the swirt nozzle design which does not sufficiently break up the herti agdomerate. (DODS) Another potential problem with such design is

that the acress threads on the cap and adapter provide

a condition in which the cap may be prameturely pulled of due to the telerateous of the across threads. As a sesuit, the dispenser may not be turned a full 1807, as restar stre range, since particles of the medicament which . #F quired. This, the proper dosage may not be provided, and the counter mechanism may not be activated. Further, by premittinely pulling the cup off, it may not be possible to easily reapply the cap to the dispenser to cione the same.

> eration may not always result in accurate alignment. (D010) Another possible problem is that of securing the powder retainer to the createring dose plate. If a bot mak achieving is used, the adhesive may leak into the mesh, so that quality and consistency is not obtained. Further, by beating the same, there may be a distortion in the fininess and/or damage to the steets.

[DOT1] A yet further potential problem is that the pawl used in the course machinism of the primary embodthereof receives an additional motal coding to be inserted therein. This increases the number of parts, makes assembly more difficult, provides a pawi assembly that is not totally moldable and does not always provide a totally reliable counter mechanism. Although a totally molded spring and panel assembly is clinchesed in a later embodiment thereof, such totally smokind apring and pand assembly is more difficult to mold and is not as estimatory in use to that of the primary embodiment. [DO12] A still further potential problem relates to the

indicis on the continuous and intermittent country (figs. of the counter mechanism, that is, the dispenses must be tipped to a horizontal position to read the numbers, rather than previding the indicis for reading while the depenser remains in its normal upright position. [0013] Leady, the deiri nozzle and moult-plece can be

birty sestly changeged from the drive body during inhaladon, possibly resulting in swallowing of the assine or choking. The same considerations are not applicable to disengagement of the moutphace from the swirt nozzle because of the inclined cities of the snoutplaces. [0014] US-A-4907583 describes a powder inhabitor

baving a ballical deflector channel to induce graff into air

flow to dispute powder particles.

EP 0 833 415 B1

2

finger out of the at least one locking recess during removel of the closure cap from the covering relation and the lower ramp portion initially bisses the at least one spring finger out of the at least one locking recess during securement of the closure cap to the covering relation. (0024) Each spring Engar includes a depression which receives the projecting portion when the closure

cap is tuly secured in the covering relation.

[D025] In accordance with yet another expect of the present invention, in addition to the aforementioned powder decemen including the powder bossing having the reservoir body and the driving body, the metaring pixtle, the spring, the extentor and the closure cap, the acticities further includes at least one helical corn track having a substantially square cross-sectional configuration, and the closure can include an annexe skirt having an inner surface, and at least one cars formed on a ligener portion of the imper surface of annular skirt for hising within the at least one helical care track.

[0025] Each care track includes an entry portion de-Onling a vertical drop zone in which the at least one cars engages prior to parmitting below enovement of the at least one cars within the at least one cars track. Prefer-

able, there are two helical care tracks and two cares. [0027] Preteracly, in addition to the alterementioned powder depender including the powder housing having the reservoir body and the diving body, the metaring pints, the spring, the actipital and the closure cap, the counter discourser includes a cas parmentile retainer for rotaining a cose of the powdered meterial in the metered does hale, the retainer being posterned below the restured done hale, with the contacting plate basing an undurable with rise thereon, the receiver being positioned in contrider relation to the underside of the metaristic plate and to the ribs thereon; and the relativer being welched to the ribs such that the ribs are fused into the

(0028) The retainer is formed by a metarial extected

from the group conditing of a gas-patheathin Plat, a depth screen, a portug material menh and a perforated plate element, and is utpropriently welcod to the rise. (0029) Professibly, the rite are formed in a plurality of epicted spart, coresistric circles, and each (f) has a BAP startistly triangular cross-sectional configuration. [0000] In an extendenent, a medical of forming a mod-Electrostating plate and gas permeable retainer thereon, includes the crops of positioning the gas permettin filtainer at a predetermined position in a first mold half count for injection making the metaling photo; provides ing a second mold half edjected. De first meld half to form a molding chamber translationers need for trainthat making the material place, the second mold half basing a Drough opening therein in allgramms with the

retainer at the predetermined position in the first stold

half, beauting a core pin durough the Deceph operang in

the second mote had been engagement with the retainer

to held the reminer in poetton against the first sook half

and its form a comment dose hote in the molded medicine.

plets; and injecting plactic meta-fall into the molding chamber through at least one injection pad to form the metering plate with the metered dose hale and with the retainer being secured to an underside of the metering

place in covering relation to the metered does hale. [DO31] is such case, the molded metaring place has a shellow recess formed at the underside thereof in ou muncles relation to the meteorid done bole, and the popudur retailour has dimensions greater than the metered done hale to completely cover the metered done hale and two than the chellow recess so as to be escured to

the metering place in the shallow recess. (DCD2) Preferably, in addition to the atorem powder departeer including the powder housing having the reservoir body and the driving body, the metering photo, the apring, the aduptor and the closure cap, the powder depender includes a base having an existly exbinding retaining post thereon coexist with the common exis and non-rotatably connected with the matering photo, and a counter mechanism, rotatably mounted on the base in surrounding relation to the retaining post, for

providing a visual court of the number of doses of the medared protected that have been dispersed or remain to the desperand in response to the relative relation of the powder housing and the muturing plats, the counter chechanium including courses rings for providing the visusi court, the courter rious being restricts about the common central axis and banked country, include themen for deploying the steam count, the counter degs including a continuous courser ring having counting indica thereon and geer trest formed theremound on an irrer surface thereof, and an intermittent counter find

coexistly recurred with the continuous counter ring and having counting indicis theman and goer teeth learned berearound on at oner surface thersol, a deplay Barough which one of the counting inclain from the counter drige is eleptoyed to indicate a count corresponding to a number of character of character of characters of cha been dispersed or remain to be dispensed; and an ac-

testay for incrementally rotating the counter rings in regroups to the relative extension between the creaturing place and the powder bounded, the activities including a panel assembly engaging with the gase texts of the contraining country and the interretaint country stay for retaining the continuous country ring one increment each time that a close of the powdered metarial is departed to digitary another one of the country holicia of the cos-

fraces country dog through the display and for reaching the transmitted country ring one increment every predeextract earther of rotational increments of the content equal countar ring to display enables one of the counting exicin of the interestant courter and financia the deplay, the parel assembly including on ones well having an eather suches and an lower surface, a paint, bangrafly potent as a single place with the cultur striction of the eater and, for expressive of the first tenth of one of the continuous country that and the bascontains coun-

territory, and a passi spring, interpretly explored as a single

[CCCCC] to one embodiment, the panel spring has a penemby L-chapad configuration, in another embodiment, the paint spring has a panerally linear configuration and extends at an angle from the baser starface of the batter wall, in either case, the pend spring has one and intograily mobiled with an upper position of the laner surface

of the outer wall. [0034]. The above and other textures of the invention will become reactly appearers from the following descripthan of an embodiment which is to be read in connection U. with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032]

Fig. 1 is a perspective view of a metered produc does dispenser according to the present invention; Fig. 2 is a perspective view of the metawed powder dose dispurser of Fig. 1, with the classes cap re-

Fig. 5 is an exploded perspective view of the one-

tared powder does dispenser of Fig. 1; Fig. 4 is a longitudinal cross-sectional view of the matered powder dose disperser of Fig. 1;

Fig. 5 is a tract alevedocal view, partially in crosssection, of the reservoir body of the snettered powder does discerner of Rts. 1:

Fig. 6 is a top plan view of the reservoir body of Fig.

Fig. 7 is a bottom plan view of the reservoir body of Po. S:

Fig. 6 is a cross-eactional view of the reservoir body of Fig. 6. taken along line 8-6 thereof; Fig. 8 is a top plan view of the reservoir plug of the 49

aniforms powder dose disperser of Fig. 1; Fig. 10 in a bottom plan view of the reservoir plug. # Flo. P.

Fig. 11 is a cide absentional view of the reservoir plug of Fig. 9, viewed from the 11-11 thereof; Fig. 12 is a cross-sectional view of the reservoir plug.

of Fig. 8, taken along line 12-12 (herack) Fig. 15 is a cross-sectional view of the reservoir plug of Fig. 9, teken along line 13-13 (hereof:

Fig. 14 is a bort elevational view of the driving body. el the matered powder does dispensar of Fig. 1; Fig. 15 is a top plan view of the driving body of Fig.

Fig. 18 is a bottom plan view of the driving body of Flo. 14;

Fig. 17 is a cross-sectional view of the driving body of Fig. 18, taken along fine 17-17 thereof:

Fig. 18 is a cross-sectional view of the driving body

of Fig. 15, taken along the 15-15 thereof; Fig. 19 is a cross-eardonal view of the driving body of Fig. 15, caken along the 19-19 thereof:

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Fig. 20 in a cross-excitored view of the driving body of Fig. 15, taken along line 20-20 thereof; Fig. 21 is a cross-sectional view shawing one of the storing fingers;

Fig. 22 is a top plan view of the matering close plats of the metared powder dose dispenser of Fig. 1; Fig. 22A is a cross-sectional view of the materino does place of Fig. 22, taken along line 22A-22A

Po. 228 is a cross-sectional view of the metering does plate of Fig. 22, taken stong the 228-228

thereof, along with the mold for forming the same in deshed fines; Fig. 22C is an enlarged cross-sectional view of a

portion of the matering close place of Rg. 228; Fig. 23 is a bottom phys view of the metaring dose

others of Fig. 22: Fig. 24A is a top plan view of a modified metering

does plate; Fig. 248 is a bottom plan view of the matering dose place of Fig. 24A;

Fig. SeC is a cross-sectional view of the matering does place of Fig. 24A, taken along the 24C-24C

Fig. 240 is a cross-sectional view of the metering dose plate of Fig. 248, taken along line 240-240

Cheract Fig. 24E is an enlarged cross-sectional view of a portion of the metering does plate of Fig. 220;

Fig. 24F is an entergod cross-enctional view of a portion of the metaring close plate of Fig. 225; Fig. 25 is a top plan view of the base of the metared powder does dispenser of Fig. 1: Fig. 25 is a bottom plan view of the base of Fig. 25;

Fig. 27 is a troop elevational view of the base of Fig. Fig. 25 is a side alevational view of the base of Fig.

Fig. 29 is a cross-sectional view of the base of Fig. 25, tatom alone line 29-29 thereof;

Fig. 30 is a bottom plan whre of the lower spring retainer of the instared powder dose disperses of Pip.

Fig. 31 is a top plan view of the lower updag retainer d Fo. 30; Fig. 37 is a side assessment view of the bower spring

retainer of Fig. 50; Fig. 23 is a cross-eactional view of the lower spring receiver of Fig. 30, taken along time 33-33 thereof; Fig. 34 is a cross-eactional view of the lower spring receiver of Fig. 30, taken along line 34-34 thereof; Fig. 35 is a top plan view of the support plate of the

cared powder dose dispenser of Fig. 1; Fig. 36 is a bettern plan view of the support plate of Fla. 35:

EP 0 443 415 B1

Fig. \$8 is a cross-exclanal view of the paint assembly of Fig. 84, taken along the 88-88 thereof; Figs. 49A-49E are longitudinal cross-sectional drawings of a portion of the metered powder does dependen, showing closing of the cap during enquantist times; and

11

Rgs. 90A and 90B are enterped orea-sectional crawings of a portion of the metered powder dose dispenses, during the times of Figs. 89C and 89E,

DETAILED DESCRIPTION OF SPECIFIC EMBOODMENTS

(0000) Reterring to the drawings in detail, and initially 19 to Figs. 1-4 thereof, a matured powder does disperser. 10 according to the present invertion includes a powder housing 20 for holding a supply of powdered methodal to be depended, and for supplying metered doese of the

provider to 4 caux. (0037) Powder housing 20 is comprised of a reservoir body 22, a meanor plus 80 and a disting body 120, each preferably being forced as a single molded plantic

(22 in 25 posses) Political to Figs. 3-8, received body 22 in 25 cludes a circular top wall 24 having an annular slott 28. extending downwardly born the periphery of circular top wall 24. Asserby sixt 26 includes an upper account with section 23 with its upper and extending downwardly from the perphary of circular top well 24, and a lower . annular sign section 20 extending downwardly from the tener and of some annalty side section 29. Lower asmaker girld eaction 20 has an lower and outer dismeter greater than the from each public distriction, temperately, of upper annotar skirt section 29. Accordingly, an Outer executer phosphar \$2 is formed at the upper and of former amouthy string anothers 30).

[UCCS] Clametrically opposite, axisily extending drive girth 34 and 38 are formed in sorotiv slift 26, each extending for a different elementweated angular extent about arruter skirt 28. For example, done skirt \$4 is shown to extend stong a 30° are chrostolerationly of the cuter chief 26, while drive star 25 is shown to extend story a 40° arc circumstructury of arrestor shirt 24. Ot course, the present invention is not firsted to those par-Stacker engine. Online state 34 and 36 are open at their leave ends \$3 and 40, respectively, and extent operatiby emirally through from according sicht accross 30 and onethely Eurough oppor enoughs add posters 29. These, Other state 34 and 36 have closed apper entite which define. # sealing edges 42 and 44,

(DONE) Powder hasseasy 20 Includes an extracto man-कोर्स की विकास का देश स्ट्राइड स्थानित से संस्थित देश नहीं 24, at a participant position plays from the center Perspl. Marshald 43 Includes are artisate pherober 47 extends - M his dispersionability to an action later. If expression county 1407 about a partybard pursus of decider top erall 24 each eraion is defined by a surrespecting chamber

wall 48. Specifically, chamber soil 48 is formed by a lowor chamber wall portion 50 extending upwardly from circutin top wall 24 and an upper chamber wall portion 52 extending opeantly from the upper and of lower champer well portion 50. The steepes of well portions 50 and 52 are substantially identical, but with the lower climenstone of upper wait portion 52 being lasts than the inner dimensions of lower and postlon 50. As a result, a shoulday \$4 is tormed at the lower end of upper chartber was 19 portion 52.

(DOA1) Carastar top wall 24 includes an opening 55 of the game phage and dimensions as lower chamber wall portion 50 of manifold 45 and in alignment with the lower and at tower charater wall paction St. The upper and of manifold 46, and particularly upper chamber well portion \$2, is closed by a manifold top wall 56 which is ampled downwardly hore the center thereof and which has an opening 58 at the center thereof.

(DO42) Apowder supply conduit 60 is formed on men-Bold top was 52 at the center thereof in allgament with opening 56. The upper end of powder supply conduit 50 is open, Powder expply conduit 50 is normally littled with powder 62 for inhetation. As used herein, the terms powdered medicaments' and "powder" include microminut powder, epheronized powder, micro-encapsulated powder, pointer agglomerates and the Ris, and are

med interchangestly with these terms hards. (DOCS) A fruito-conical tradition ventual conduit 64 is also formed on circular top well 24 substantially perafter to powder expply conduit 60 and actally offset from the central axis of caratter top well 24. The center axis of position stopply conduit 40 and the center axis of venteri conclut 64 lie on a circle having a certar coincident with the center of circular toe wall 24, so as to be nomi tioned at a peripheral portion of circular top seed 24, the thace because gried 40 bus 00 electron to exce spect.

along such a circle by an angle of approximately 1057. [DOAC] Specifically, venturi conduct 64 is formed by a burn verteri conduit mechan (ili and an topar verteri conduit section 68 galaxy algored therewith, each reducing in lower discrete trans a tower and thereof to an opper and thereof. The upper and all apper venture conduct exciton 63 is open, and upper varieti conduit exciton 63.

trace di accordant disservation (bujus browner velocitati constituit entrotion (\$6 on that an insur-graphs shoulder 70 is festined as the larmy edge of appear ventual constalt earlies 63. Chester top east \$4 includes a further opening 72 of the some phape and dimensions as the bower and of lower venture controls section 68 and in subgramment Commercia. [DO45] A perpetual securing seal 74 extends gener

ady atopul activates are on a peripheral portion of circular top wall \$4, in europatching relation to lever character well parties \$0 and lower vestion conduit earlies \$2. A gap 76 is provided in excusing well 74 at a punition opposte contate 42 and 64, and two parallel, aparallel apart, radelly extending tabs 78 extend isvertly from appoints wide of securing wall 74 at paip 75. Further, a radially exceeding excepts by 80 extends outneedly from EP 0 883 415 B1

Fig. 37 is a crises-excitoral view of the support phase of Fig. 35, calcon along the 37-37 thereof.

Fig. 33 is a cross-sectional view of a portion of the metering does place, exposet place and powder retables according to an attractable embodiment of . the present inverton;

Fig. 39 is a cross-eactional view of a portion of the metaring dose plats, expport plats and powder retainer according to another attenuable embodishers. of the present inventory

Fig. 40 in a troop elevational view of the edepter of the meteral powder dose dispensar of Fig. 1; Fig. 41 is a cich elevational view of the adapter of Fig. 40.

Fig. 42 is a bottom plan view of the adapter of Fig. 15

Fig. 43 is a top plan view of the adapter of Fig. 40; Fig. 44 is a cross-sectional view of the adapter of Fig. 43, taken along line 44-44 thereof;

Fig. 45 is an enterped cross-sectional view of a postion of the educar of Fig. 41, showing the window

Fig. 48 is a top plan view of the swid nextle of the metered powder dose dispenser of Fig. 1; Fig. 47 is a bottom plan view of the swirl noticle of

Fa. 48: Fig. 48 is a side elevational view of the swid nozzle

of Fo. 48: Fig. 49 is a cross-sectional view of the swirl cozzle

of Fig. 47, taken along line 49-49 thereot; Fig. SSA is an enlarged bottom plan view of the centor of swid occurs of Fig. 48;

Fig. 508 is a cross-sectional view showing excursment of the swirt rozzte to the driving body. Fig. 81 is a top plan view of the mouthplace of the 35 metered powder dose dispenser of Fig. 1; Fig. 52 in a cross-sectional view of the mouthplace

of Fig. 51, taken along line 52-52 thereot; Fig. 63 is a proce-sectional view of the mouthplace. of Fig. \$1, taken along line \$3-53 thereot;

Fig. 54 is a buttom plan view of the mouthplace of Fig. 51: Fig. 55 is a side elevational view of the most/spiece

of Fig. 51: Pig. 50 is a side elevational view of the closure cap. 49 of the metered powder dose dispenser of Fig. 1; Fig. 57 is a bottom pion view of the closure cap of

Fig. 56; Fig. 55 is a top plan view of the closure cap of Fig.

Fig. 59 is a cross-sectional view of the closure cap of Fig. 57, taken along time 59-59 thereof; Fig. 50 is a cross-sectional view of the closure cap of Fig. 58, taken along line 58-68 thereof; Fig. 61 is a parapactive view of a lower inner portion (5)

of the closure cap of Fig. 58, showing one cam then Fig. 62 by a cross-sectional view of the closure cap

13

[0046] As will be understood from the description

bereinster, it is necessary that the lower earlace of di-

plug 90 to provided, as shown in Figs. 3 and 9-13.

(0047) Specifically, reservoir plug 90 includes a Utin

climater place 92 which can be molded, because of the

Changes of pixty 02, to have a very amough lower ma-

them with no undulations. The outer charmeter of circular

place 52 is substantially equal to the inner decreater of

emper arrestor citit portion 28 on that reservoir plug 50

case be it therein, as shown in Fig. 4, in seath condition,

the lower surface of circular place 92 effectively in Desh.

with senting singus 42 and 44 of other state 34 and 36.

(COCCI) Circular plate (2) has a circular hole 94, a first

exhibitatively and help St and a payond exhibitionally

good hole \$6, all having contains extending along an im-

[QD69] A circular plug conduit 100 is formed on the up-

per surfaces of circums place 92 in asymputing relation

to circular hole 94. Concluit 100 in open at its upper and

lower ends and has an outside demander and a height

embeta-rainly equal to the inside diameter and height, re-

spectively, of tower vertilal control section 64 and an

inside departer equal to the inside distretor of upper

wanted conduit section GB. Those when reservoir plug 90

to inverted within apper arrestor start section 28, plug-

conduit 100 the energy within lower ventual conduit acc-

tive \$5 and the inner curtary of plan conduct 100 forms.

a amostic continuation of the issuer systems of upper ver-

but conduct mection 43, in such condition, the upper edge

of plug conduit 100 abuts against annuter stroubler 70

so that so gap is formed between plug conduit 100 and

[DDSD] An arcoste plug conduit 102 is formed on the

oppor surface of cliquitir plate \$2 in autrounding relation.

to first and second substantially oval holes 96 and 98.

Plug conduit 102 has the same shape as lower charater

week postern 50 of stansbold 48. Plug conduit 102 is open

of the speed and lower ands and has an extricts shape

and dimensions substantially equal to the inside shape

and dimensions, respectively, of lower chamber wall

purche 50, inside stope and dimensions squal to the

factor shape and dimensions of apper chamber wall

portion 62, and a beight equal to the height of brear

chamber wait portion 60. Those, when reserveir plug 80

conduit 102 the enopy within lawer charries and poster

60 and the free statute of plug conduct 152 hours &

ecounts continuelles of the inner eprison of apper charts

bur stall position SZ, its auch condition, the upper edge of

plug conduit 102 abata against aboutow \$4 so that no

gro is formed between plug covered 102 and appear

(DOST) Although the easter explanate of plug conducts

chamber will portion 52.

and within appear german which excelor 23, phay

upper versusi conduit section 63.

aginary circle contered at the centur of plate 92.

the upper and of securing well 74.

ce. Therefore, to overcome this pr

of Fig. 68, taken along line 62-62 thereof; Fig. (5) is a cross-sectional view of the choose can of Fig. 60, taken along the 63-63 thereof;

Fig. 84 is a bottom plan view of a destroors holder of the metered powder dose dispenser of Fig. 1; Fig. 65 is a cide elevational view of the designant holder of Fig. 84;

Fig. 85 is a cross-sectional view of the desicosts holder of Fig. 64, taken along the 625-63 thereof; Fig. 87 is a top plan view of the continuous courter ring of the metered powder does discesses of Ris. 1: Fig. 68 is a bottom place view of the continuous courto the of Fig. 67;

Fig. 68A is a cross-sectional view of the continuous counter dag of Fig. 87, taken along the 69A-69A

Fig. 698 is a cross-sectional view of the continuous courser ring of Fig. 67, taken along the 698-698 Chevrocal;

Fig. 70 is a side elevational view of the continuous counter dag of Fig. 67;

Fig. 71 is a top plan view of the intermitent countar ring of the metament powder done dispersion of Fig. 1; Fig. 72 is a bottom plan view of the immentions counter ring of Fig. 71;

Fig. 73 is a cross-sectional view of the incombinate counter ring of Fig. 71, taken along time 73-73 (here-

Fig. 74 is a gide elevational view of the intermittent counter ring of Fig. 71;

Fig. 75 is a top plan view of the paul assembly of the metared powder dose dispenser of Fig. 1; Fig. 76 is a bottom plan view of the paul essentity of Pla. 75:

Fig. 77 is a side allowadonal view of the panel assessbly of Fig. 75;

Fig. 78 is a reer elevational view of the pour assemby of Fla. 75:

Fig. 70 is a cryst-excitoral view of the peak extent bly of Fig. 75, taken along line 79-76 thereof; Fig. 80 is a top plan view of a past assorbly socording to enother embodiment of the present in-

Fig. \$1 is a bottom plan view of the pawl assumbly of Po. SC;

Fig. 82 is a side elevational view of the panel assertbly of Flo. 80:

Fig. 83 is a cross-sectional view of the panel assessbly of Fig. 80, taken along time 83-83 theroof; Fig. 84 in a top plan view of the passt assembly according to another embodiment of the present its

Fig. 85 is a bottom plan view of the peel accumbly of Fig. 84: Fig. \$2 is a side stave,tional view of the panel assem-

by of Fig. 14; Fig. 87 is a cross-sectional view of the panel assumbly of Fig. 84, taken along line 87-87 thereof;

EP 0 683 415 B1

100 and 102 are discussed above as being emoth, it will be appreciated that such outer surfaces can be borned with ribe 104, as shown in Figs. 11-13. [DOSZ] As an effernative embediment of meanwair place culter top well 24 be so amouth as possible, that is, with 90, a reservoir plug 90' in shown in the cross-eactional wary fow undulations therein, However, this is difficult to actions when exciding meanwair body 22 as a single Fig. 4, in which elements corresponding to those of rea-

> marals, with a prime () appended thereto. [20053] As shown, plug conduit 100' has an inner diemake with a trusto-conical configuration that tapers from an upper end to a lower end thereof, to provide a vertisi effect, in addition, the inner diameter of artists plug conduit 107 may be greater than the laner dismater of upper chamber wall portion 52°. Purther, to better en-

auro a emocra lower sustains, a thin flat, circular metal

photo 63° of atoctropolished staictoess stool is secured to the lawer surface of reservoir plug 60°. In such case, plate 127 has an opening 101° of the surre dimensions as accepts plug conduit 1027, white must holes 98' and 65' are provided in metal plate 95'. Of course, metal plets ST has a further circular opening RT coincident with circular hole BF of circular phate 92'. Preferably, countri raico 927 la issuar contidud coto a plastic buse (14) tested. The metal porton coreacts dooing plate 180 in the essectived device, providing a very file, except and rigled exertises his enterwined populate high laces from the remerkely. in action, the manifestations any state electricity charges generated by Stotion between surfaces that ig

does toeding operations, which charges can adversely affect country from into sent out of the doubts station. (DOS4) As shown in Figs. 14-21, driving body 120 inchiche a displar top wall 122 tuping an excise start 124 extending downwardly from the periphery of circular Ep wel 122.

(DOSS) Assults start 120 includes on upper annular giát section 128 with as upper end extending downnearly from the periphery of circular top wall 1.22, and a frame annulus clair section 129 extending downwardly from the lower and of upper absolute state earlies 126. Lower extrator skirt section 122 bas an inner and oxfor

discretify greater than the issue and cotter discretions, toepectively, of upper arouter stat section 126. Accordingly, an large associar shoulder \$30 is formed at the lowor edge of upper generals odds section 125, along the deside of annulus clost 134. However, the outer surface of the transition area between upper environ ditt eerzon 125 and lower accepts skid saction 125 in formed as a

Ingra-conical surface 132. (2005) Purchay, the leaser discontant of lower streets stirl section 128 is expetantially the came to the outer waste d'apper emblis sicht section 25 et meancir body 22 and the inner classical of upper assular stat. eaches 126 is subcassing the carry as the total dataager of participated securing and 74 of research body 22.

Accordingly, massively budy 22 lbs links drawing body 120 with a close to writ the cachally excending security by \$0. at perpharal excusing well 74 attach against accordin STREET, LICE

EP 0 833 415 81

15

[DOSE] Chroster top wall 122 is formed with a chroster opening 142 which is oligned with and receives frustscontrol ventual conduit 64 as that the upper edge of trusto-conical venturi condust &4 is substantially Dusts with the upper ourtace of circular top well 122.

[0003] A circular plug conduit 144 depends downwardy from the tower autice of chooler top wall 122 and is in alignment with powder supply condult 80. Circular plug conduit 144 has an outer dismater substantikely equal to as eligibly greater than the landle diameter of powder supply conduit 60. Them, plug conduit 144 closes the upper open and all powder supply conduit 60 25 when receively body 22 is assembled with driving body 120. Therefore, powder 62 can only excape through manifold 45, opening 55 and substantially ovel holes 96

(0000) Further, a slightly inclined, curved retaining #0 such 148 extends describedly from the lower surface of circular top well 122 in partial autrounding reliation to circuter opening 142 to ensure a further experation between powder supply conduit 60 and trusto-conical venturi conduct 64 when reservoir body 22 and driving body 120 are executivet.

[0061] In order to provide for exconding air flow, as will be described hereinsther, the wall defining upper anracker staff excellent 128 extends inwardly in the racket direction to form a limit outer air passage 150 adjacent to clicular spening 142 in the circumferential direction of circle body 120 and a exceed outer air passage 157 having to center acceptally special approximately 100° from the centur of that air passage 150.

(DDEZ) Short, extistly excending upper guide walls 154 enti 156 are torned along a constron circular arc spaced alloyely investily from the periphery on the apper surface of circular too well 122 in order to excuse a coutrie to driving body 120, as will be described in greater dotal ination. Specifically, apper guide wall 154 is formed 🔑 circumferentially along the larger art between air pessages 150 and 152; and upper guide well 156 is formed circumberecially sleng the amplier are between air paseague 150 and 152. The common circular ard along which upper guide walls 154 and 158 extent in specod allyitly from the peripheral edge of circular top well 122 as as to define an ensular retaining ledge 159 on discutar top wall 122, positioned outwardly of upper guide walls

154 and 156 in the radial direction.

(DOST) Fear substantially equipmently arranged. MONOREIC BYCUILD FROMING 1583-1586 are formed on netaining bedge 158, the purpose for which will be accounare trum the discussion horeinstar. Receases 158a-158d extend along different arcents distances. For exarrole, recesses 158a and 158c may extend for arcents digrammes of 39 degrees; recess 1565 for an arquiste elletance of 42 degrees and recess 1584 for an arcuste distance of 48 degrees.

[DOSA] Further, tower exercise stift section 128 is out enery at two discretifical positions thereof to form two diemeritmity exposts driving appinings 184 and 185 containing two diametrically apposite spring lingers 183 and 185, respectively, extending downstantly and stightly

outwardy from their connections 167 at the intersection of upper enricher stirt section 128 and lower annular thirt section 128. Spring Engara 163 and 185, as shown, extond below the lower edge of lower ennuter skirt section 128. As will be described hereinstax, diffing openings 184 and 185 are engaged to rotate driving body 120. As shown, each spring Roger 153 and 165 is best or formed into a concess shape so as to have a depression 171 therein, extentionly controlly located with extract to the lengthwise direction thereof.

[DOES] Finally, a recess 169 in the chape of an arrow is feathed in lower procise shirt metion 128 at a position stakency between driving spenings 164 and 165, and in radial alignment with circular opening 142, with the asnew pointing downwards.

82 from powder supply conduit 60 to venturi conduit 64. a matering chas pieza 180 is positioned within upper anmaker abilit auction 2) of reservoir body 22, immediately below reservoir plug 90, as above in Figs. 22, 22A-22C

(DOSS) In eacher to provide metered doses of pounder

and 23. Specifically, matering dose plate 190 frictides a thin day 122 having a single small metaned then belo 184 near the periphery thereof which functions as a single powder receptacle, that is, for holding a metered done of powder 82, in order to prevent the metered done of powder from falling through dose hole 184, a powder receiver 186 is formed in covering relation to the lower austiace of dies 182, extending at least ever does hale 184, Professity, powder retainer 180 is formed by a mesh screen, Titys, parous material or the like which has a criminal restrictive effect on gas flow therethrough, while preventing appreciable loss of powdered medicament below the lower surface of disc 182. Powder retainer 183 can be inbrigated from any suitable (hitterial, including cellulosics, polymerics, metals, ceremics, glasses or compostes thereof, exemplery useful maleriets including sixtured perous plastics, perous polymer mambranes, natural or available woven fatales, reviewven synthetic fabrics and the like. More specifically, caebut meterials include polyecter and polyectelle woven

mesh, and parous masterance of polyotehne, polyote-

bonatus, poly-istračuorosthylene, polyvinytidene

distribution, and missed extents of collumns.

[DOE7] to this regard, matering does plate 180 has a distribut shellow recess 183 at the underside of this clies. 182. Shallow racess 183 is concertify with metarad does hate 184 but has a larger claimater than that of metored dose hole 184. Powder retainer 188 has a circular configuration with an outer character again to the charastar of attailing means 120 and is secured within shallow mones 183

[DOSS] With such an arrangement, there is a problem In accurately positioning powder retainer 186 in shellow secons 183. Specifically, with a hot met adventue, the edhesive may leak isto the most of powder retainer 185. Platting, quality and consistency in positioning of powder stainer 186 therein cannot be obtained by this method. Further, powder retainer 185 may be distorted, thereby deviating from the fletness thereof, or may be demaged, by a heating operation.

(DOSS) Therefore, in accordance with the propert in-

vention, to easily and accurately form powder retainer 185 within shallow recess 185, matering does plate 180 - # to preferably formed by an insert molting operation. [0070] Specifically, as shown by deshed lines in Fig. 223, provider retainer 186 is inserted at a predetermined position within a first most half 187 which is used to form Straturing dose place 120. Thes, the complementary secand motel half 189 is positioned with respect to first mold half 157 to form metaring does place 180. Second mold half 189 has a through opening 191 in allowhest with the predstarmined position at which pender retainer 185 is postlered in first mold half 187. A core pin 193 - 29 to insected within opening 191 and serves the dual purposses of holding retainer 188 in place and also forming metered does bein 194. Then, plantic in injection molded into the maki through at least one injection port 195. As a result, shallow mones 183 is formed around powder 25

cataloge 186. [0071] Thus, the injection molting operation results in powder retainer 186 being secured to the plastic, without compranising the flatness or openness of the mesh thereof. Further, a very small much screen can be used for powder retainer 186, rather than using a screen cocupying the entire undertaction of disc 182, as in the eforementioned WO9414492.

(5072) The use of a small mesh scenes much in more accurate postloring, less undulations therein and being 49 able to be formed with disc 182 in a totally externated

[0075] An annular mounting post 189 extends downwardly from the lower surface of clerc 182 and is centrally tocated thereon. Armiller mounting post 185 is formed with a ber 100 extending axially along the inner surface of mounting post 126 in clamatric relation to matered does hole 184. Ber 190 extends from the lower surface of disc 162 to a position eligibly spaced from the lower edge of mounting post 1.03, and preferably has a square cross-ecclonel conferencion. As will be understood from the description haraltetter, bar 190 ensures that metering dose pixts 180 will remain stationery with re-

apect to powder housing 20 when provide housing 20. which includes mean of body 22, meanor plug 90 and driving body 125, is extend.

(DX74) In operation, metered cose belo 184 is intistly in alignment with transpromised venturi conduit \$4. As will be explained hereinatus, powder heusing 20 in easy permitted to rotate 180° rotative to snaturing does place 190. Ouring initial privring rotation, metered dose hole 184 passes under transfeld 48 and substantially ovel

boles 98 and 98, As a result, powder 62 talk within and is scraped into meteral dose hote 184, Specifically, the side walls defining management y and being \$5 and \$8 function to screpe the powder (2) has received does had 154. If will be appreciated that, gince eval holes 95 and 98 are special less than 180° from circular hole \$4, ma-

tered dose hole 184 travels completely peel evel holes \$6 and \$6 and manifold 45. Then, during the retorn retation back to the lattel position, matered dose hole 184 cases back under manifold 48 and substantially ovel holes 98 and 58, into alignment with ventual conduit 64. During this return travel, the side water defining automortaily and hales \$6 and \$6 again function to excupe the

powder 62 into metered does hale 184, thus ensuring

that metered does belon 184 is completely and accurately filled. Thus, the eccepting ection is provided during both counterclockwise and clockwise rotation, that is, both during the 180° leading stage and the reverse 180° movement to the inheliation stage. When metered dose hale 184 is aligned with worker conduit 64, it is then only necessary for the user to inhale through venturi conduit.

64, causing a draw and suction through matered dose hole 184, wherein the metered does of powder 62 is drawn up through venturi conduit \$4 and dollwared to the user. (0075) A modified metering does plate 180' will now

be described in connection with Pipe, 24A-24F, in which elements corresponding to those of metarleg dose plate 180 are identified by the same reference numerals with a prime (7 added thereto.

[D076] Metering does plate 180' is positioned within upper annular stat section 28 et reserveir body 22, immachinary below received plug 60, as with metaring dose plate 180. Specifically, metering dose plate 130' lectudes a thin disc 182' having a single arrest material. does hole 184' near the puriphery thereof which func-

tions as a single powder receptacle, that is, for holding a metered does of powder 62, in order to prevent the metered dose of powder from falling through dose hole 184", a powder retainer 188" is formed in covering relation to the bowr surface of disc 1827, extending at least. over does hale 164'. Preferably, powder retainer 186' is

formed by a mesh acreen, Mer, porous metartal or the the which has a minimal restrictive effect on gas flow therethrough, while preventing appreciable loss of powdaved medicament below the lower surface of the 122. Powder retainer 1367 can be febricated from any autoble meterial, including callulation, polymerice, metals, curantica, glasses or composites thereof, exemplary

EP 0 533 415 81 20

usabl metarials including cintered porous plantics, poreus polymer menticanes, subural or synthetic woven fabrica, possesses synthetic fabrics and the Res. More appetitionity, quarter materials include polyester and polyclusto waves meet, and norms municipality of polyclethe, polycerbonetes, poly-terefluorostiplenes, polyvisyltime christation, and mixed esters of collutions. (0077) However, unlike powder retainer 186 of metering dose plate 190, powder ratainer 190' is formed along

substantially the entire undersurface of dec 182, as ahown best in Fig. \$48. Thus, there is no formation of a shallow recess 1 (C) as in clac 122, in this regard, powder retainer 1 88" has an annular configuration with an outer denotes eligibly analise than the outer dismeter of disc.

[0078] Its circles to secure powder retainer 190° to the underside of disc 122°, the underside of disc 182' is previded with a plurality of concentric ribe or epitus 185, each having a substantially invested triangular crossexclosel configuration. With each arrangement, when 🥬 the much acrees of powder rabiner 180' is positioned on the underside of disc 182, an ultrastric webling operation is performed. Specifically, obtassoic energy is directed toward the underside of class 1.87, in such case, the conceptric entires 125' function as energy directors. 25 which about greater exputs of energy than the remainter of the sectorality of the 187. As a most, the clarify preterief of endow 125' is fused into the mesh to secure powder retainer 196' (barnet. With this arrangement, there is a undotte graphy that is applied for eachiing powder retainer 1967, and an automated operation Can be used to perform such ascering operation, achieving a consistency at all firms.

[D075] As with metering does plate 180, metering done place 180' includes an accular prounding post 188" extending downwardly from the forest surface of disc 127 and customly booted burson. Aventer thousting post 187 is formed with a bar 197 extending existly along the bener excises of propring post 1937 in clarities ric relation to contrared done hale 1947, Bar 1907 extends the order beight of mounting post 187, and preferably him a notine cross-sectional configuration. As with metaring dose place 190, ber 197 ensures that matering done plate 1907 will remain electronicy with respect to powder bouting 20 when powder housing 20, which inchicks reservoir body 22, reservoir plug 80 and driving body 120, is recent.

(COSC) to code to produce by this mindres reaction, maraiding down place 190 to reco-scioolity procured on, and powers training 20 is rotatively mounted on, a bean 200, stone is Figs. 3, 4 and 25-29, these 200 includes a circular top well 202 having an worder stirt 204 extending community from the parighary thereof. The purpheral extra of chicalay too seed 200 is cultivary to define as make greater beings \$50. As greater mappening by \$500 is formed on the eathy gustace of eccesive gift; 204 at the former and thereof, so as to expend extraorily therefrom in the racial direction of greater plat 204. As assector

wall 209 having a dismeter less than that of supporting To 208 is formed at the upper and of supporting tip 208, As shown in Fig. 4, annular wall 209 can have a plurality of existly special spect, annular teeth 211 on the outer surface thereof, in addition, an accuser retaining rim 210 is formed on the uncer outer curtace of acquire citit 204, parallel to supporting to 208 and annular was 209, and spaced above armster wall 209, so as to extend outwardy from sender sidt 204 in the radial direction

thereof. Retaining rim \$10 has a clemeter eligibly less their the character of areacter well 200. Thus, an anounce retaining grap 212 is formed between executor wall 200 and retaining riss 210. (0001) Further, a small post 214 is formed, extending

commender from promotor work 200 to a helicité above retaining rim 210, but below top well 202. Post 214 has an outside dismeter equal to that of annular well 200, and also is connected with retaining rim 210 and extends within oso 212.

[D062] A cylindrical bose 216 is formed centrally and exhally on the upper surface of circular too wait 202, with on upper annular portion 217 thereof partially cul-every ent a rackel segment 219 thereof also cut sway. A coexial retaining post \$18 of leasur diameter then cylindrical bose 218 is formed at the upper and of cylindrical boss 218. Accordingly, an outer annular ledge 220 is formed at the upper edge of cylindrical boss 218. Retaining post 218 has an exter demaker elicitiv has then the inner districtor of armshir mounting post 108 of meturing does plate 190. Retaining post 218 is formed with a stot 222 along the bench thereof, Accordingly, due to ber 190 and dat 222, mounting post 183 of contaction does plate 180 is retained on retaining past 218 in a nonrotatable menser to encure Post metering dose plate 180 will remain stationary with respect to previous focusing 20 when powder nousing 20, which includes reservoir body 22, reservoir plug 90 and others body 120, in recessed. (DORS) Two short stub with 221 and 223 are formed on the upper entace of top wall 202, transdictely on

accounts about of cylindrical basis 218. Each water 221 and 223 are angled with respect to each other at an angie of equipmently 30 degrees. [DOS4] As part of a counter mechanism which will be

described in greater datall benefitsfler, a first solution provestion spring dataset 224 is included in a conflictor market on charles top well 2012. Specificable, a curved vertical details expending wall 225 excess asserting from clearly the well 202 of a continue constraint with way between account ladge 206 and cylindrical boss 218, and first retailor prevention spring datest 224 exturns from one edge 228 of detail supporting wall 225, parallel to and special above carpins too and 202, Fortrus, this base stat) of that rotation prevention spring de-

230 harast. (COSC). Also so part of the country mechanism which will be described in greater datasit benefitsible, a second mission prevention spring detect 232 a massiant in a

ters 224 is provided with an automorp cachely chreched too

cartillever rounteer on discular too well 202. Boardically. second rotation prevention spring distant 232 extends

EP 0 113 91

from edge 226 of detent supporting wall 226, parallel to and speced shows circular top wall 202 and pareful to and special above that rotation prevention spring details. 224. The free end of second rotation prevention spring detent 232 is provided with an outward rackely directed bb 234. [0096] A triangular shaped sectored recess 236 is

21

lotted to circular too well 202 to correspondence with 49 detants 224 and 232, and dismetrically opposite to post 214. Specifically, recess 236 includes a first radial boundary 240 substantially in line with the consected and of dataset 232, and a second boundary 342 extending in alignment with the langthwise direction of detart. 19

(0007) Further, a shallow recess 243 is provided at the cutter radial actor of assister lactor 206, in allowment with acciding facous 206, and clamatrically opposite post

[DDES] In order to spring bias metering dose place 180 into encedement with the lower surface of this circular plate 02 of reservoir plug 90 and to ensure that provider \$2 can only be inheled when metered does hole 134 is in efforment with venturi conduit FA, a blasing assentity because d

[DOES] The bisning assembly includes a lower spring retainer 250 mounted on annulus luctor 220, over retaining post 218, as sheets in Figs. 3, 4 and 30-34. Specifically, lower spring retainer 200 includes a disc 202 houing a contrat opening 204 sized to receive retaining your 213. An accorder bone 200 extends from the lower surface of disc 252 is exmounding relation to cereal opening 254. When retaining post 218 extends through ancular boas 268 and cardral appealing 264, the tower edge

of according books 2000 sensity contail naturality laybox 220. (DDSC) An upper esteador reclairáng fip 253 ectando upwardy from the peripheral edge of dec 252, Further, two racially extending driven care 270 and 272 are formed in diametrically opposite positions at the perbhasel sizes of arouter to 250. For 270 has a width extractably egyal to the width of other slot 34 of reservoir body 22 so as to it there's and he drives thankly, and ser 272 time a which patients with a court to time which of drive plat. 36 of communic body 22 op as to 8 therein and be driven

(1007) Forther, an arcests could diving self 274 cohands from the forey surface of chic 262 between energy. har brown 268 and the periphery of disc 252, for an artistal distance of approximately 79°, Paul driving well 274 inchicke appoints paid dhing stick 276 and 278, as will by described in greater detail hereivables with reference to the country mechanism.

(2002) The blacky assembly further location a colsection 200 hashing one and sented on the under surface of that 252 of breat strains retainer 250, and restrained

thereon by estudie retaining to 253. (DOSC) As stones in Pigs. 3, 4 and 35-37, the blanks

assembly further includes a surport older 300 which exports matering dose plate 180, functions as an export apring retainer, biness matering does plate 180 against the lower audice of thin circular plate 92 of reservoir plug 90, and permits suction strough metered down bale 184 only when metered does hole 184 is in alignment with venturi conduit 64.

77

[DOSG] Specifically, expoort place 300 is formed by a day 302 having an annutar retaining to 304 extending downwardly from the pericharal adop of dec 302. [DOSS]. Two radally extending others ears 306 and

303 are formed in diametrically appoints positions at the peripheral edge of annular lip 304. Ear 306 has a width minetacticity equal to the width of drive and \$4 of cases. voir body 22 as as to fit therein and be driven thereby, and our 300 has a width substantially equal to the width of drive sixt 88 of reservoir body 22 so as to 0; therein and be driven thereby. The failcht of eacs 306 and 308 is less than the baidte of assubr in 304, and lower surtypes of ears 308 and 308 are automatchely flysh with

to cot so tended. [DCBE] in addition, a curtical discular hote 310 is formed in due 502 and is sized to exceptly receive annular mounting post 183 of metaring dose plate 180 therein. A rackely extending stat \$12 extends from and is in comcognization with circular hote \$10, Shet \$12 extends outwardy in the rackel direction by a distance such that the racially outer part of slot \$12 everlaps matered dose

the lower edge of executor to 304, although the invention

hale 184 when metered dose hate 184 is in algrement with venturi conduct 64, and is out of alignment with, and thereby then not prefer, prefered then hole 134 at all Ather Boss.

(DODY) As described above, powder receiver 196 in formed by a mest screen, they power metales or the On which has a command restrictive effect on gas flow Sharethrough, However, which is much stream or the Rois used, there is a reduction in gas flow, and thereby of any suction by the user, of apprecimately 20%. According to an alternative embodiment, as shown in Fig. 33. powder retainer 186 comprised of a mean across or the Donates by relocated to the lower section of chirc 202 of support plans 200, under stol 312. Therefore, although

the much access or the the reduces the gas flow through carbate extending that \$12, this does not extend that sorter than gase flow photosph metavant coses hales half wealth in grapher than stot \$12. Then, primary air tipe is factspercent of the commencional with of contains done phase 190, Further, Come to no memb powder authorier 198

at continued date hate 1944 to reclude air figur foreign meformed places backs 134. (DOM) As above in Fig. 29, which is an abstractive surbodiment of the errorgement of Fig. 33, doi:312 in sup-

port plate \$500 in angled at appeals of the thorself in a COMMENTY CONTYNG REACHY, With STANDARD STREET the air flow cross-enclased area at the betters of plut \$12 can be made greater than four times the air flow copesenclosed area of contract does hole I.M.

11

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[DCSS] It will be appreciated from the above descripdon that metering does plate 196 is hald editionary on base 200, due to ber 190 and also 222. Further, powder bousing 25, comprises at reservoir body 22, reservoir plug 100 and driving body 120, is recently mounted with respect to bese 200 and meaning does place 180.

23

(0100) in addition, support place 300 is blaced into segagetters with the lower statute of metaring does plate 180 so as to support the same, to the operation, racingly extending stot 312 is in alignment with cristwind done hale \$34 only when metared does hale \$34 is in edgement with venturi concluit \$4. Thus, any powder 52 within matered chare hele 184 when metared chare hole 184 is out of all prepared with venturi conduit 64 is sandwiched in material done halo 184 by much powder retainer 186. (9 and the upper surface of day 302 of support plate 300 at its lower and, and by the lower surface of this circular plates \$2 of reservoir plug \$0 at its upper end. As will be discussed in greater datal hardhafter, in the stored or intactive position of matered position does disputeer 10, 🚁 metered does hale 184 is primed, and is positioned diemetrically opposite to racially extending stot \$12. In much position, powder 62 within metered does hale 184 is held between the upper surface of clies 302 of support obits 300 and the lower surface of this discuster plate 522 25 of reservoir plug 90, and therefore cannot escape metaved does hale 134.

(0101) In order to positively hold all of the above elements together, meterad powder dose dispenser 10 further includes an extenter \$20, as shown in Figs. 3, 4 and 40-45. As shown therein, adapter 320 includes a lower sepular well 322 having an inner dismotor larger than the outer demotor of lower sonder slot section 30 of reservoir body 22 so as to easily fit thereover. The inner character of lower generalist was 522 in soho eligibily larger 45 then the output diameter of executor plots 204 of base 200 no as to its thereover, but alightly less then the outer demeter of arcellar retabling this 210 of base 200.

(0102) An annuar greave 324 is formed at the inner, lower and of lower arrival stell \$272, eligibly appeared above the lower edge thereof, Accordingly, due to the resilience of the plantic places, when adapter 320 is inagetad over base 200 and pushed down thereon, retaining rim 210 of base 200 emps into annular groove 324 to hold adopter 320 on base 200. At such time, encular 49 teeth 211 can engage the inner ourface of lower excular wad 322, as shown in Fig. 4.

(01(03) In order to obtain and maintain correct alignmerá batween adaptor 320 and base 200, adaptor 520 is provided with a small stat 328 within process 524. Stat 📁 520 has a width substantially equal to that of small post 214 in base 200 an as to receive the same thereis. Of course, it will be appreciated that post 214 can be provided to edigour 520 and skil 229 can be provided in chape 200, that is, with a reversel of parts. Them, rotation 49 of adapter \$20 causes base 200 to rotate therewith. [0104] The outer surface of lower associat woll \$22 is prefarably provided with a gripping surface 328 formed

by undeteriors, brushing trithe Site, to exhance the gripping and ratation of metered powder times thepenser 10. 20105) A rectangular opening \$29 is formed in lower provider and \$22, substantially diametrically opposite to stor \$25, and substantially centrally along the height of lower arouser wait 322. Opening 529 is formed by a large inner operating portion 529e and a contiguous outer opening postion 32% of emailer dimensions, so as to form a rectangular shoulder \$290. A rectangular transparent plastic window \$30 in fixed in opening \$29 and includes a country window portion \$300s which lits enough within outer operang portion 329b and a large lacer securing portion \$305 of larger dimensions that fits within large loner opening portion \$29s and is ascured to rectangular shoulder 329c by an achiesive, welding or the

which will be described in greater datas hereinaber. [D106] Adapter 320 further includes an upper annular wall 332 of a leaser dismotor than lower annular well \$22, and connected to the upper end of lower annulus was 322 by an outer annular shoulder 334.

Size. Window 330 is used with the counter mechanism

(0107) An ensuler blesting tip 338 is formed on the isner purtice of upper ensular well \$32. When aductor 320 is pushed down as as to lock adapter \$20 onto bease 200, as described above, annular blesing to \$38 seets on outer attriulter shoulder \$2 of reservoir body 22, and thereby bisses reservoir body 22 down against the force of coil spring 200. Accordingly, coil spring 200 is compresent so that a blesing force always forces support plate 300 into abultment with metaring close plate 180. and always forces metaring dose plate 190 into abutmust with reservoir plug 90. However, such blacking action at 8 partition of reservoir body 22 relative to adverter 320 and metaring dose plate 180.

[D108] At the same time, this compression ensures that others ears 270 and 305 will always be located within drive size 34 and driven ears 272 and 306 will stronge the beautied within drive plot 36, so that rotation of reserv volt body 22 will cause consequent rotation of forest appling retainer 200 and support plate 300. Because metering close place 180 is held stadenery on base 200, due to ber 190 and sixt 222, powder housing 20 foorsprised of reservoir body 22, reservoir plug 90 and driving body 120), lower spring retainer 200 and support pizza

300, are extendly mounted with respect to been 200,

metering does pists 180 and adenter 320.

[D108] In the separation condition discussed above, the lower edge of lower environ start section 128 of driving body 120 years and rotates on the expost edge of upper exhibits well \$52 of adepter \$20. In order to provide eir flow through metered dose hale 1,84 of metering dose plate 150, two characterity opposits recesses 340 and 342 are formed in upper arredur well 332, extending from the upper edge of upper arouter wall to annular blesing to 338. Peacese 340 has a width identical to the width of drive stot 34, while recess 342 has a width Ideatical to the width of tithe stat 38. When metered does hole 184 is aligned with ventori conduit 64 of reservoir body 22 and with racially extending sict \$12 of expost plate 300, recess 340 is in algorment with crive aloi 34 and recess 342 is in alignment with drive sick 36. Accontingly, exclion on venturi conduit 64 causes air to Dow through recess 340 and drive slot 34 and through recess 342 and drive stot 38, and then through rackety extending slot \$12, metered dose hole 184 and venturi concluib 64 to deliver the material does of powder 62 in metared dose hole 184, to a user of dispenser 10.

25

(0110) In addition, two diametrically opposite recesses 344 and 348 are formed in upper enterior wall \$32, extending from the upper edge of apper annular wall to a position electricy above assester blestro to \$33. Re-COSTAG S44 and 342 are shallower than recesses 340 and 342, and are oriented to be 90 degrees other imm recesses \$40 and \$42 such that recesses \$40-346 are equiangularly arranged about upper arrester well \$32. As will be made apparent from the discussion hardredfor, recesses \$44 and \$48 are intended to receive spring. Segmen 185 and 185 to lock the assembly in position after the cap has been removed.

[0111] As shown in the top view of Fig. 43, recesses 340, 342, 344 and 348 each have one able thereof with a bavel \$45 toward the inside authors thereof, the ourpower for which will become apparent horeinster. [0112] A couble helical carn track 352 le formed on that cutter arethose of unper anouther well 332. The trappose for which will become apparent from the description which follows. As is apparent, the walls 353 that form double helical track \$52 have a substantially square cross-section, the purpose for which will become experand from the discussion hereinather with respect to the cap. Further, the easily 351 to each com track 352 is formed as a vertical drep zone bufore rotation can begin, thus ensuring accurate registry of the closure cap and 27 thereby, accurate operation of dispenser 10, as about best in Figu. 40, 898 and 89C.

(0113) Lextly, the lowerment water 353 have a common inverment surface that extends in a horizontal plane, and together with outer annular shoulder 554, form an annulur proove 355 therebetween for seating an O-ring 557 therein, Such O-ring 357 provides a vapor

[7114] Its order to ensure that the powder in de-agglomerated and properly mixed with the auction air Imm 49 the open upper and of upper ventual conduct section 58 of warder conduit 64, a main nozzta 330, as abown in Figs. 49-50, is mounted to the upper end of reservoir body 22. Air which contains agglomerated powder perticles flows from upper venturi conduit section 62 into the wift nezzle. Machanical de-agglomeration le se important function of the swift neggie.

(0115) Swirt negris 380 includes a decate too wall 382 and an annular side well 384 actending downwardly from the periphery of top wall 382, Annular side wall \$94 has an outer diameter substantially equal to the outer dismeter of upper annular stirt section 126 of orlying body 120. Further, the inner connecting region 386 be-

herein circular top and \$22 and annular also well \$34 is curved to provide a emocity transition therebetween and thereby to provide a amouth flow path for powder 62, in other words, the ones area defined by circular top wall 332, annulus aids wall \$34 and loser concecting region 228 has a somewhat partiel toroidal configuration. The cuter connecting region 300 therebetween, bowever, forms a substantially right angle in cross-excion between circular top wall 382 and ecoular side wall 384.

19 [0118] In order to secture exvisionazzie 380 onto the upper end of diving body 120, and particularly, croto accular establing ladge 150 of diffiling body 120, four spiked ribs \$22, 393, 394 and 395 are equipmently formed extending down from the lower edge of areader side wai 384. Spited the 322, 233, 394 and 358 extent arcusts distinces which are different from each other and which correspond identically with the arcusts distances of arcests recesses 158a-158d, respectively, of driving body 120 so that swid nozzle \$30 is againstited

at a predetermined position with driving body 120. For example, exited the 302 and 304 can extend for an arcusts datance of \$3 degrees; apliced rb \$93 for an arcosts distance of 40 degrees; and spilled rb \$26 for an arcuste distance of 44 degrees. Splited the 392, 893, #3 294 and \$96 extend slong a common circle having a charanter equal to the common circle around which recesses 1556-158d extend. Thus, append rbs 392, 393, 394 and 396 extendruthin measure 158s-158s, respectively, with a top degree edjustment cinerance, Proter-

staly, each apiked (b 393, 393, 394 and 396 has a teperiod and with a substantially triangular cross-eactional confirmation. (0117) During an inhabation process, swift nozzle 330 and the mostiplece (discussed later) secured thereto might detach from driving body 120 and be excellered. Therefore, in order to fixedly secure swift nozzle \$80 onto driving body 120, as ultrasonic welching operation is

performed, Specifically, ultranonic energy is directed toward gritted this 392, 293, 394 and 396, in such case, the spiked or sharp ends of the 352, 393, 394 and 396 function so energy directors which obsorb greater arrabilità of energy. As a requit, the plantic michrisi of aniloud sibs 392, 393, 394 and 396 is funed into the pinethe materials of recourses 15th-15th to secure point noz-

zie 300 en aching body 120, as enown in Fig. 608. With this arrangement, there is a uniform energy that is applied for accuring avid nozate \$80, and an automatic oparation can be used to perform such securing operation. achieving a consistency at all times.

[0110] It will be appreciated that, in such position, first and second outer air passages 150 and 152 extend inwards of annular side wall \$54 to expoly secondary air Sow thereto which entres with the exipowder existers from ventual conduit 64 which in also supplied to the ittector of annular side east 334.

(0119) Circular top well \$32 has a central opening 402, and a supply chimney 404 is formed on the upper surface of chicker top well 384 in surrounding relation

13

EP 0 880 415 B1

thereto from sold cavity 412, the existing flow applies a contributed force to the informized powder and remainby applomerates, creating additional impacts in exactly chimney 404 so as to result in further breaking up of the maining agglomerates.

[0123] Most of the applicments break-up should take ches, however, in parkt cavity 412. The velocity attained by an applomerate depends on the drag or suction force. the inside of the applications, and the length of swirf cavity 412, that is, the time the drag force acts on the egalomerate. Because of its Inertia, the applicaments isspacto a wall in unich carrier 412 to convert the senter to coloradzed powder.

(0134) in addition, with the present invention, chimney 404 is provided with vertically oriented grooves or finance 405 extending along the igner well thereof. Plates 405 provide more surfaces against which the agglomenties can impact against. Plates 405 are shown as being formed by six vertical concave well sections 411 of a first radius, which are interconnected by the vertical conceve well sections 413 of a larger rackin, or even of a first, plants configuration, that is, infinite raction. However, any other exitable errangement can be provided. It is profession, however, that whetever arrangement is provicted, flutes 405 or any other configuration are vertically orteneed, and thereby provide as knagular vertically estercad sustace. Purther, as aboun, facus 405 professibly extend from the upper edge at chiraney 404 to the upper edge of curved and 406, ethough the present invention is not so broked.

(0125) Flutes 405 aid in the break-up of agglamerates that require greater de-egglomeration factor to dis-

[0126] Experiments have shown that flored swift notthe 380 immunes the requirem fraction over a wirdler sold accele which is not fasted. Specifically, for hard nogiornarates, such as them having a bulk density in the range of 0.29 - 0.35 gird, the same sold records without these provided approximately a 10% respirable fraction, while a fluind swift negate provided approximately & 35%. respirable fraction. Thespirable traction for purposes of Tress experiments is the parcentage of total particles delivered from the neight that are less than or equal to \$.5 columnature in document, an extraordinationing across t-erage figuid impireper, in the experiments, the formebillion was reproductive and include deplementate in a

component weight rate of 1 to 5.8.

(0127) In addition to breaking up applicmentate, swift cozzte \$50 most coss additional constraints. For example, the pressure drup through the powder interior about desirably be lower than about 20 feature of a mixthe column (5 Kps) for each of use by persons with itspained respiratory function, yet exclicitarily high to permit styrificant primary air flow prough costared dose hole 134. The precious drop princips sold assorts 330 can be changed by varying the angle between exit 410 and the position where the first and assured excitons of curved wall ACE steed, that he, where the second section became

central opening 402, as shown in Fig. 47. In a presently preferred embodiment, this angle is about 1657, 46though this value may change depending upon the re-

garred pressure drop. (D125) Further, an enrular mostiplece securing wall. # 418 is formed on the upper switece of circular top wall \$22, special alightly investly from the peripheral edge. therapi. As a moult, an armster ledge 420 is formed on the upper surface of circular top word 382, extensibly of ennshr moultiplece securing well 419. Further, an annoter to 422 extends outstandly in the radial direction from the upper and of emister mostlipiece scouring wall

[0125] Alast, goer tooth 424 are provided on the apper estige of arresplant monatisphene securing well 418. Although forty goer teeth are shown, the present invention is not so limited.

[0130] Finally, a locator tab 428 is provided on the upper sustance of circular top well \$22, along the loner surface of goar teath 424, demotrically opposite the loca-Con of venturi conduit \$4 in the Days assembled condition of the inheles.

[0131] A mostiplace 440, as shown in Figs. 3, 4 and \$1-65, is secured to the upper end of swift nozzle \$80. Moutipiece 440 Includes a generally rectangular top wall 442 with an exputar side wall 444 depending downwardy from the periphery of top well 442. Because top wall 442 has a generally rectangular configuration and because of the assolut configuration of side wall 444, upper portions at opposite sides 446 and 445 of elde wall 444 corresponding to the langthwise sides of top wall 442 stope upwerdy in a diverging measure toward each other. The fire of a man of the device are placed co niche 448 and 448 during inhabition. Of course, since the way's mouth is placed over mouthnises, the vertexts eciges (hereof are rounded.

[0132] A central opening 450 is centrally forward in top wall 442, and an arrestar connecting table 452 is formed at the lower contacts of too wall 442 in commandists mitthis to opening 450. When constrplace 440 is second on swift noutin \$30, connecting toba 452 receives the spper and of expoly chimney 404 of switt nozzle 330 there-

[D133] In order to accuse mouthpiece 440 to said sea-2to 380, the lower and of side wall 444 has a circular or menutor chance. At the issuer exchance of this boost and of white well 444, there is increased are assuring V-chapped projuction 454 which extends inwardly to the radial direction. When mouthplace 440 is positioned on sold actable \$20 and cressed down thereon, excelor to 472 of swift eazzle 300, due to sychence of the plastic pieces, rides ever V-shaped projection 454, an that V-shaped projection 454 ectains account to 472, and thereby most opions 440, en amid agrate \$20, in such postion, the lower ector of attra wall 444 pits an assenter bettyn 427 of smith . At DOJZIO 330.

(0134) Further, two sets of three peer treth 480 are formed on the bour extres of damagically exposite

gicins of annulus aich wall 444, irranadiately above annubs V-chaped projection 454 and positioned centrally of appeals sides 448 and 448 of side wall 444. What mouthniese 440 is essential with said nozzle 330, peer teach 480 engage with goer teach 424 to prevent relative rotation between moutrolece 440 and swirl noz-

(0135) Referring now to Figs. 58-63, a closure cap

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\$20 of metered powder does dopensor 10 is provided en a cleave for moutiplace 440, and at the same time. functions to prime metered powder does disperser 10 tor use. Specifically, closure cap 520 includes an apper atonoxical armular povering wall 522 which is closed at to upper end by a generally chouler top wall 524. A lower annular securing sixt 528 of a larger diameter than annuter covering well 522, is secured to the lower and of granular covering wait \$22 through an account frustocontrol connector 52%. The forms and all appular auconing start 525 is open. Purcher, the inner diameter of lower ensular securing citin 528 is slightly larger than the outer charmeter of upper associar wail 332 of adapter 320 to an to fil become

(27.36) In coder to secure closure can 620 axes matered powder dose dispenser 10, and perticularly, in covering relation to mostliplinos 440, two help came 530 are formed in diametrically opposite relation on the inper earther of lower prouder excuring sidt \$28. Thus, when closure cap 520 is inserted over powder housing 20, sold rozzle 330 and mouthpiece 440, came 530 of desure cap £20 inbally vertically drop in entry 25 1 and then Executedly engage with double helical care track IS2 of adapter \$20, until the lower edge of lower enouter excuring plan 526 seats on the annular fronts-conical coneacting section 334 of adapter 329.

(0137) & is noted that came \$30 and cam track \$52 are provided in place of conventional acres threads. This is because, with conventional screw threads, cap \$20 may be premaring polled off due to the tolerance of the Errects. As a result, metered powder does depensor 10 cray not be operated correctly, that is, not hated a fed 180" during pricing and delivery thereof. However, withcome 530 end cam track 352 bending wells 253 of a equate cross-section, correctors achievitaque are actioned, including preventing previouse operang of cap \$20, was of can, beauting proper bucklos at all three of the rotational positions of the party of dispenses 10, and executing that the counter (described benefits)

ter) is always correctly activated to always correctly change the dose coord. Thus, cap 520 can red engage with extenter 320 and cares 630 are fully argued in case teach 252, as stoom best in Figs. 898 and 89C. (0155) 4 will be approxisted that the outer describe of

tywer acceptor eaching disk \$28 is extentionly identical eth the total december of boost annular well \$22 of graphy 120 to provide a relative provide, combination ascontrarce in order to aid in the removal and closing of chause can 520, the color scribes of lower accorder ancurry dut \$26 is formed with a grouping apriles \$22

27

to central opening 402.

(0120) to crear to break up the pseudor againmenton. prior to expptying the earns through supply chimney 404, a curved spiral-like wall 406 extends downwardly from circular top wall \$27 and is connected at one end 403 to enough eith wall 534, Specifically, curved wall 400 extends in a cumilinear treatner from and 400, and partially about central opening 402 to an opposite end-410. Thus, a gap 400 is provided between and 410 and the remainder of curved well 408. The height of curved with 406 is exactly that of exactly ofte each 334 on that the lower edge of curved self 406 sits on circular top wall 122 of driving body 120 when awirl nozzte 580 is generated with differs body 120, as described above. Curved wad 406 is effectively instead in two sections, namely, a first section starting from and 410 and autombing periody about central opening 402, for example, for 165°, and a accord section extending from the end of the first eaction to end 408 along a larger rackus them the first section, With respect to the direction of the rathus to the custor of yester) conduit, \$4, the excond section preferably between or desingages from central opening 402 at an angle of approximately 15" paradial to such ractus line, expendence of the size of swirt nozzie \$30. (0121) As will be appreciated, curved well 406 defines a making the powder for weather condisk \$4 michra authoristy 412 and continuously changes. direction as & increases in velocity, prior to entering supply chitmey 404. Thus, the powder accilomerates con-well 334 and current well 406 within swift covity 412. Further, the engineeratus collide with each other which reexits in a motusi grinding or sheltsing exiton between the applicmenture. At the same time, secondary air flow from Brit and second outer air paysages 150 and 152 . 49 actions sold casely 412, as indicated by across 414 and 418, respectively, to accelerate downwest of the powdur agglomerates in exect cavey #12. The correlate impacts of the powder applicantains on the walls defining early casely 412 cause the applementure to break up into

(0122) Further, rether then providing a marrier helical path along the extel direction of a nozzle, as in the prior ect, cornect and 406 and, particularly, sold courty 412. that changes the direction of powder 52 from an exist direction of ventual conduct \$4 to a francisco direction substantially proposed outer to the extel direction, in this transverse direction, powder (2 is then forced in cordssouth conta director in the excession director of and control 12. Upon entract militaryty 412, the distrition of promoter 62 is again counged to an exhibit direction. Directly districtly COL, with rathing a most #5 component of the flow (but is, while staining apirally CHOSES CHOMB CO4, Since the priconstruct country and between blue out ricedem enterprinting apparatu

microstized peopler upon impact. Basically, as long as

the powder applications to be with extraint valuety,

there will be nufficient based energy to break up the up-

CONTRACT.

EP 0 823 415 B1

formed by undutations, brurless or the Disa, to enhance the groping and routing of closure cap \$20.

[D135] As discussed above, closure cap 520 also serves to prime matered powder dose dispenser 10 for uses. Specifically, a first pair of parallel, existly extending, epected sport priving ribs \$34 are formed on the frame gurtace of closure cap 520, extending a arrest chatance down from fruits-conical connector 525 ento lower anenths securing side \$28. A second pair of parallel, existly extending, special spect printing ithe 536 are other termed on the inner surface of closure cap 520, extending a small distance down from trusto-conical connector \$25 orby boost associate associate state \$25, in districts cally opposite relation to priming rise 534. The priming ribs 534 and 536 of each pair are specied sport by a disturnes eligibly less than the width of differe recessors 1.64 and 186, respectively, of others body 120, for blasing aprice fagors 162 and 165 invently, and also, for exgaging sides of driving recesses 164 and 185 to rotate of the priming rise \$34 and \$36 has a lower ramp portion \$35 and an upper cump partice \$37 which sheet at an Extermediate projecting purion \$30 and reduce in Dich-

ness as they move away from projecting portion 539, (D140) When closure cap 520 is removed from metared powder dose dispersor 10, metared dose hale 184 is in afgrenary with venturi combit 64, ready for inhadation by the user. Thus, dispenser 10 is fully primed and ready for inhelation by a person. At each time, spring fogure 163 and 165 are postioned in recurses. 344 and 348 of adapter \$20. These, dispenser 10 is tocked in this position.

(0141) The operation of Immitting classics cap 520 is shown in Figs. ESA-ESE and Figs. DOA and SOE. After the inhabition operation, closure cap 620 is positioned on the assembly, as shown in Fig. 89A. At this time, came \$30 are not engaged within comitracity \$52. Upon turning of closure cap 520, came 530 fail within the beginning portions of carn tracks \$52 and can be pushed. down therein, so shows in Fig. 598 and 49C. At this time, priming rits 634 and 538 engage and push in epring Degers 163 and 105, and also engage sides of divide recesses 164 and 188, in other words, during the initial closure operation, lower ramp portions 535 of pristing ribs 534 and 638 argues upper portions of spring fagers 180 and 165 and bias the same invastily of differe recesses 344 and 346. This is shown in more detail in Fig. 90A. As a round, driving body 120 can rotate religive to adupter 320 to the closed position, as shown In Figs. 850 and 85E. During this time, cap 529 angages with driving body 120, so that continued turning of cap 520 results in berning of driving body 120 relative to principles \$20. As cap \$20 is notated, it is pulled down by centre \$30 ricing in cent tracks 352.

[D142] At the complotion of the rotation, and because of the configuration of apring largers 163 and 165 and the complementary configuration of priming rice 534 and 518, spring lingura 163 and 165 spring back itso a

tucking position less making engagement with priming the 534 and 536, 180" offset from the inhabition condcon, that is, with spring fingers 163 and 165 positioned in recesses 345 and 344. Further, because of the meting relation of spring fingers 163 and 165 with princing ribs 634 and 636, printing ribs 534 and 538 are miss, at this time, positioned in microscop 343 and 344, to other words, intermediate projecting portions \$35 of printing -mongraphoquernoo afrillaw benkusen erus 822 bass 8422 aug cave portions of spring Engage 183 and 185, as shown

32

best in Fig. 90B. (0145) It will be appreciated that when cap \$20 is in the tudy channel position of Fig. 83E, apring fingure 183 and 165 are returned to a free state, that is, a state in

which there is no stress on spring lingurs 163 and 165. This is provided so that over time, spring Groses 160 and 165 to not take a personnel set or deformation in a biseact state, as with short plantic meterials. This would be depimental to the operators of the Ethniar. The perdriving body 120. As shown best in Figs. 59 and 63, each 🥬 Scater shapes of oping timpers 150 and 165 and priming the 534 and 538 are provided for this purpose.

[0144] Thus, closing estation of chosure cap 520 causso the rotation of striking body 120, and thereby of venturi complet 64 religious to enstared does hale 164, to the stored position, 180° out of alignment. During this travel. powder 62 is scraped into metered dose hole 184, ec that material powder dose dispenser 10 is primed.

(0145) When the mer is ready to use metered nowder dose dispurser 10, closure cap 529 is unacrewed from adapter 520, During such reovernent, apring Pagers 163 and 165 fallistly angage with bevolt 545 on recessors 346 and 344 which cause spring lingers 163 and 185 to move investily in action not to hinder extention. Thereather, ea cap 520 begins to rise, spring fingers 163 and 165

again are engaged by printing ribs 534 and 538 which puch in epring lingurs 183 and 185, in otherwords, during the initial opening operation, upper ramp portions \$37 of printing rise \$34 and \$38 engage upper portions of apring fargers 163 and 185 and bles the seare knowns.

ly of recesses 344 and 348. Accordingly, driving body 120 can rotate relative to adapter \$20 to the open posi-

[0146] This results in apposite rotation of driving body 120, and thereby of venturi conduli 64 relative to meturned close hole 184, to a position in efigrement. These, as soon as closure can 520 is removed, matered dose hole 184, which is filled with powder 62, is in electronest with venturi conduit 64, and ready for inhetation. There is thus no could to provide any additional priming and

est-up operation ester closure cap 520 is removed. [0147] Further, closure cap 620 includes ehr exidengutarly special protrosions \$38 formed at the laser ourface of covering well 522, spaced a small distance from 000 wed 524.

(0148) To protect powder 62 against moisture contermination, a dealocant holder 500 is held by protrusions 638 within cincure cap 520. As shown in Figs. 64-66, destroyed holder 550 includes a circular top wall 562 and

an exhibit aldo well 564 extending down from the periphery thereos. An ensular recess 500 is tormed in the laner exitace of encolor side wall 564 at the lower end thereof for receiving a dec (not shown) which holds a Omiczara, such as clica gal, thereio. An excutar rib 563 is itemed on the outer surface of prouter eith wed \$54. to this manner, desirement heather SAC in inserted within closure cap \$20. Due to the resilience of the plantic planon, annulus sto 553 siches over protrusions 538, so that desiceant holder \$60 is held within closure cap \$20 adjacent top wed 524 thereol. A silght modification to theinner! holder 580 is otheren in the assembled view of Fig.

33

(0140) A counter conchanism 580 is provided for counting the repriser of does that have been dispensed. or indicating the number of doses that remain to be disperced, so as to warn the user of impending powder displation. Nitry types of mechanical and electrical COUNTRY are useful. A digital electronic country can be disposed within the base or other areas of the device, and will require electrically conductive contacts which complete a circuit at some point is the dose loading operalism; the characteristics of the required bellary will be a factor in establishing a shall life for the device. Presantly profested is countar mechanism 580, a decressenting mechanical counter that indicates the assober of doese remaining to be dispensed.

[0150] Courter mechanism 880 is comprised of the eforementioned first and accord rotation prevention apring detacts 224 and 232 on base 200, the storagementioned transparent plastic window 330 of adapter 320, a continuous counter ring 500, an intermittent counter ring 520 and a spring-bissed paul essentitly 640.

[V1S1] As shown in Figs. 3, 4 and 87-70, continuous counter ring 590 is formed by a disc 592 having a wall with a substantially rectangular cross-eaction. An outar arrivity ledge 694 is formed on the outer, upper edge of dec 572 by cutting away disc 582 themes. Further, a lowor enrular lip 596 axially extends from the lower, outer edge of clac \$62, as a emooth extension of disc \$62, but of a losser cross-sectional width. As a result, an inner excutor ladge 592 is formed at the lower edge of disc 692, in this recent, continuous counter ring 590 can be seated on base 200, and in particular, inner enruter ledge 533 aeats upon chicalar top wall 202 of base 200 and lower actician to 590 easts on annufar ledge 205 of base 200 in aurounding relation to circular top wait 202. [0152] A plurality of numerical ladicia 600 are printed on the emosth contained outer surface of dec 602 and lower arrutar lip 606. Specifically, two auccessive sets of numbers "O' through "I' are printed equiencularly thereabout. Namerical indicis 500 are printed in a vertical marner. Thus, indicia 500 can be read while metered provider dose dispenser 10 is uprigits, that is, in the manner that it should be used.

[0153] Twenty gear teeth 602 are equienquisity formed on the inner surface of disc 582 in correspondence with the twenty numbers of numerical indicis 600.

All goes much 802 have the same depth in the rachel direction, with the exception that disrestically opposite coer test): 804 and 808 of geer test): 502, corresponding to the apposite ournbers "8" of purportant indicas 600, are desper than the remaining guar stack 602, that is, goer teach 604 and 506 extend outwardly in the racket direction to a greater extent than the remaining great teach 602. When continuous counter ring 500 is sested on base 200, first rotation prevention spring detact 224 of base 200 organie with one pour both 802 at a time, to prevent electrole rotation of continuous courter ring

500 on base 200. [0154] As shown in Figs. 3, 4 and 71-74, internities. counter ring 620 is formed by a disc 622 baving a well with a substantially rectangular cross-section. A lower actuals to 624 existly extends from the lower, outer etige of class 622, as a empoth extension of class 622, but of a local conce-sectional witth. As a must, at limit ensular tedge 628 is formed at the fower edge of disc 622, to this regard, intermittent counter ring 620 can be rotatably seated on continuous counter ring 590, and in particular, from ensular ladge 626 is speced above con-Bhucus counter drg 500, while lower ansolar \$p 624 seats en euter annuter ledge 594 of continuous counter

pno 500.

[0155] A plurality of numerical Indicia (22) are printed on the smooth combined outer surface of disc 622 and lower annular to 624, Specifically, numbers "O" through "19" are pristed equiesquiarly thereshout. Numerical incicia 828 are printed in a vertical meaner. Thus, indicis 629 can be read while matered powder dose dispenser 10 is upright, that is, in the manner that it should be mad. [0155] Twenty goar touth 630 are equienquilarly borned on the inner surface of dec 822 in correspondonce with the twenty restricts of numerical indicis 625. All over teeth 830 have the same decth in the radial direction. When betweenthard counter ring 620 is exacted on continuous counter ring \$90, second rotation prevention apring detent 232 of base 200 engages with one goor

tooth 630 at a time, to prevent clockwise rotation of istermitant counter ring 620 on base 200. As will be apprecised from the decussion which follows, goer tooth 630-extend along a largor diameter circle than poor tresh 607, an that goar meth 630 are outstantly displaced in the radial direction from geer teeth 602, [0157] Further, a dose limiting tab 632 extends up-

wardly from the upper sectate of disc 622, corresponding to a position between numbers 'Y and '10', is orevent operation of metered powder does disperser 10 after a prescribed number of does have been depersect. For example, where metered powder does depenser 10 is limited to discensing 200 doses, dose limting tab 632 can abut against a dosage firnter tab 936 of scienter 320 after dispensing of the two bundledfit does, to prevent further relative rotation of powder homeing 20 with respect to metaring dose place 180, as will be described with respect to the operation hereinships. (D158) Initially, number "19" of Indicks \$29 is ofigned

FP 0 223 415 81

216 of base 220 within radial augment 219, thereby biacing pand assembly 640 outstardy in the radial direction. This causes pand 654 to enter into engagement with goor tanth 602.

[0182] It will be appreciated that, by forming spring 658 integrally in a single molding operation with pend assembly 840, the member of parts is reduced, a single molding execution is utilized, assentiny of the parts is easier, and the epring can be made more flexible and

[0163] It will be appreciated that, when pand expenditly \$40 is positioned on base 200, apposite sides of Ushaped retainer 650 are positioned within singled stub made 221 and 223, so that there is just extilicient room the purel assembly 640 to robbs by a small engle, in order to function as a ratchet assumptly with respect to the over teeth of counter rince \$00 and \$20.

[D184] Referring to Figs. 80-83, Share is shown a spring-bissed panel assembly 640' according to enother embodiment of the present invention, in which elements corresponding to those of panel assembly \$40 of Figs. 75-79 are identified by the same reference numerals, with a prime () acided therein,

(0165) The only difference between part essembly \$40° great possel accountably \$40 is treat than from earch of appring 658' of print attentibly 640' has a slight convex curveture every burn the fixed and thereof.

(0155) Petering to Figs. 84-69, there is entrem a spring-trianed pend seasonably SEO" econording to still asother embodiment of the present invention, in which elements corresponding to those of people assembly 840. of Pigs. 75-79 are identified by the same reference tramercels, with a double prime (*) actinct therein.

201877 One difference between part assembly \$407 and panel assesses \$40 in that applying \$587 of panel essentily 840°, rether then being formed as a substantudy L-shaped chamber, is formed is a generally linear mention with topored sides, extending at an angle from

the appet and at the laner scatace of avanute wall 844". Arminer difference is that throps \$40 in elemented ar-(2162) In the operation of courser mechanism 580,

beer spring retainer 200 satures 180° with reservoir body 22 relative to meaning does plate 190 between the stored position when closure cap \$20 is threeded entiadapter \$20 and the inhabition position when closure cap \$20 is narrowed from adapter \$20. When metawad powder does discover 10 is a the stand postion, parel 654 is engaged within a shallow past tools 672 of contended country stro. \$30, and Country, then not all gage with a great both 630, Further, in each position, pant others and 27th of accuse paint driving well 274

(D153) When reservoir body 22 is rotated the first 179* greated the establish position, parel driving and \$7% of around provide tribing well 274 is received into every appropriate with the opposite picts of posit accountly \$40. As a result, count (Sel in proximal are fract it enters out of the stratfore gates)

erconcile with paul assembly \$40.

37

33

tooth 602, thereby compressing spring 658. When ten doese have been dispersed, continued rotation to the full 1907 causes panel 654 to rotate a eligital emount and tabilities the next gase tooth 604, which is a deep geer tooth, for example. Specifically, spring 658 blesse pant 654 into goar tooth 604, Since goar tooth 604 is a deep caser tooths, posed 654 also enture one of the caser teach 430. At this point, matered powder does dispenser 10 is in the interaction coatton in which material does hale

194 in in adcorners with verturi conduit 54. EDT 201 After the user inhelies the dose of powder 62. closure cap 520 is threeded back onto adapter 320. As e manif, reservoir body 22 rotates back to its initial coaltion, which also results in rotation of lower spring rebeiner 200. During this rotation back 100°, that is, parel driving and 276 of arceste pant driving and 274 engagas with panel assentity \$40 at the end of its imprem to receive pound assessmbily 640 to its helded provident. Overing auch movement, eince paul \$54 is angaged within deep gear tooth 604 and one of the gear teeth 600, both conthrough counter flog 500 and intermittent counter flog 620 are rotated together one increment, to the case where pand 654 is not engaged with one of the deep gain trusts 604 or 606, paint does not arrange with a gain both 600, so that only the cordinuous counter ring 590 Details and bases

[7171] It will be appreciated that continuous country that 590 and intermittent counter ting \$20 cannot within in this apposite direction because of that and second retation prevention toring detects 224 and 232 which engage with gear teeth 602 and 630, respectively.

(0172) It will be appreciated that various changes can be made to the above embodiments. For example, retation of metaring time plate 180 need red be 1977, but could be for a leaser or greater arcoule distance. In such case, the length of arcusts paset driving wall 274 would be chanced to incrementally date possi expensibly 640. [0173] Accordingly, with the present invention, a memont counter does character 10 is psychold that accurately instances the doses of positives medicament to be delivered to the patient. Specifically, disperser 10 is constructes and expending construction and expending even the

[7174] All of the above elements, with the exceptions of metal place ES and coving 25th, are preferably fathre cated born reactly available plactics, while the former parts are preferably fabricated from exitable metals. Typically, the various components which do not require parently or other special properties will be excited from one or more thermophetic autotances being the Obwee rigidly and strength, to some embedraents, the companies containing the powers exceptable is relativeby thin and, so maintain a required dograe of acritica flatcess, will be communied from a less easily deformed extension mech as a relationant plantic, carrier of mateal. Of course, expenses extended exact be chemically competite with the medication to be dispersed. For meanis of cost, a maximum stitution of plantics will be

gretarred where the device is intended to be disposable with no, or only a limited number of, medicament refile etter the Initial charge has been dispensed. Other "composits' components can be used elsewhere in the device where special properties are required. (D175) to cross to assumble metared powder done

eer 10, powder housing 20 is first a Specifically, reservoir plug 90 is inserted within reservoir tends 22, destroyed bolder 500 is ensured into classes cap \$20, maid pozzle \$80 is expectated with driving body 120 and mostiplace 440 is assembled with swift sozzie \$30. Next, continuous courter ring 520 is St onto base 200 and intermittent counter ring 620 is \$1 onto continsome counter strip 500. Both counter rings 500 and 820 are rotated until the number "19" of internations countri drg \$20 and the norther "V" of continuous counter ring \$00 are in alignment for chaptey through whatow 330, to other words, this corresponds to the searcher "190".

(D176) Pend essentily \$40 is then positioned on top circular wed 202 of base 200 in aurrounding mission to cylindrical boss \$16 and between with walls 221 and 223, with pawl 854 being blased into engagement with gear touth 604 in alignment with the number "5" and the goer tooth 830 in eligerment with the restrict "9", that is, is alignment with the number "55", it will be appreciated that first each paccook relation prevention apring detents 234 and 232 are in efformed with open both 606 co-OCO stock was not star bas 'V' rectuus or probagues. corresponding to the number "18".

(0177) Therestier, tower spring retainer 200 is posi-Burned on bean 215 in numbered ng relation to retaining post 218, with narrow citiven our 270 in alignment with the number "199" on rings \$90 and \$20, in such case, point othing and 27% thereof is in abutment with Range 643 of panel essentity 640. Coll spring 200 is then each ed on date 252 of lower spring retailour 200, and appoint plate 300 to placed as top of out apring 250, with correct Others our SCS thereof in alignment with names other ear 270 of towar spring retainer 250. Then, annular mounting post 186 of matering dose plate 180 is posi-Borned Detrough, control circular hole \$10 of acceptat plate 200 and over retaining past 213 of been 200, with the 190 and stot 222 in eligenteis, its each case, meteres countries 184 is in abstract with circles extending that \$17 of except size \$00. (\$17%) Theo, received body 22, familing reservoir play

80 executables thereofth, is knowled over material dose chies 180, respect plate 300, coll spong 250 and busin extract plats 250, each that resour diven sees 270 and 306 Di militira compre direta del SA, and evidar delima auch 277 and 208 ft within within time and 35 of appropri body 22. In such case, venturi corroat 64 is in alignment with suggested done hole 134. In order to assessta the above parts ingelier, adopter 220 is then placed ever the above assectely such that sta 224 thereof is in alignmore with grad \$14 of bean \$50, Adaptor \$20 is thus creased down cold secretar factor 210 of these 200 scans. into general province 22st of achievan 32th. At this simp, cold

only continuous countar ring 550 rotates so that the numbers "19" and "\$", respectively, are exposed to form ...

the number "196" which is exposed through white-530. After the next ribe chaes, only continuous country ring 500 relates one increment at a time for each does. After the number "190" is exposed through window 330. the next dose results in both continuous counter ring 590 and intermitted counter the 620 subtine to form the number "135". This operation continues until the rumber "00" is exposed through window 530. At this time, interrelizant counter ring 620 has been retained to a position so that does limiting tob 632 abuts against dosecs limber tob 336 of adapter 320, to prevent forther relative rotation of psychot bousing 20 with respect to

with runnber "O" of indicis 600 to form the number 198,

which is exposed through transparent plactic window

\$50 of advocar \$20. After the first done in dispensed.

metering dose plate 180. EPISSE in order to career each estation of continuous counter day 500 and intermittent counter day 620. spring-blessed pseul assembly 640 includes a panel driver 842, as shown in Figs. 3, 4 and 75-79. Parel driver 642 includes an arcesta cutar wall 644 having a height groutor then the combined builds of continuous counter fire. \$80 and incomplains country day \$20. A U-chaped retainer (CCC) is connected to the tree ends of excusion wait 844, U-channel retainer 650 has a height lace than than of arcists wall 844. Accordingly, a loop distring an optio area 652, is formed by arcests well 844 and U-chapsel retainer 650. A Dange 648 of a montanisally binary. For cross-exclosefconfiguration, brave an extension at one aids of accusts well \$44 at the intersection thereof with U-chaped retainer 650, but being of a height exhaustietly extend to that of U-stageed rateiner 650.

(D150) A panil 634 is carpally lemmed on the outer or convex ecotocs of ercents wall \$44. Thus, when peak times \$42 is insured an circular too well 202 of bean 200 in surrounding relation to cylindrical bosts 218, parel 654 can be breated within a geer tooth 802. However bacassa gaer treth 600 estand along a largur character 🤲 circle then gear tests 602, pant 654 can only engage with grew meth 802 and set with grew meth 630, The costy exceptions in whom posed (CSA engages within cow cd. great backs 604 or 604, he each cause, becomes great backs \$04 and 808 are chaper than the remaining great teath. \$52, panel 654 can reach less and arrgage with gear tooth 630. Since your leads 604 and 606 are specied spart by ton great buch, peral \$34 engages withits one of the goal test) \$04 or \$05 every test) does depending, and thereby expenses within one of past texts 600 at excts time to retainedly drive intermitted courter any \$20 with continboos country my \$30.

[PT&T] In coder to blue papel (SA into angagement with goar treth ETZ, a best, extensively inverted L-chaped apring 658 has one and izzagrafy formed corotally, in regard to the electroline and polytroline directions, at the area curious of arcounts and SMA, with the first part Charact that ging down to push against cylindrical term EP 0 833 415 B1

string \$30 is contrasted, the number "100" appears Directly window \$30 of actions \$20, and recesses \$40 and 342 of ecliptor 320 are in alignment with drive state 34 and 35, respectively, of reservoir body 22.

[0179] Therestor, powder supply constall 60 in filled # through the upper open and thereof. These, othing body 120, with nozzle 320 and marchplace 440 thereon, is fit ever received body \$2, such that discuster plug conduct 144 of diking body 120 plugs the upper open and of provides supply conduit 60 and such that the upper open 29 and of vertical conduct \$4 extends through disputer opening 142 is driving body 120, in this position, the least sticm of lower evening eiths excises 12% of differe body 120 is positioned immediately above the upper edge of upper arrichar wall \$322 of adaptar \$20.

(0120) Course on 520 is than breaded arts adjecter \$20, whereby pender boosing 20 is rotated 180° rais:0ve to metariting does place 1 80 so as to prime metored powdur doss dispenser 10, that is, so as to acrape prouder 62 into material close Irola 184. This moves paid 654 to ... the next geer took \$02,

(D121) When a sour desires to totale a dosege of the powder 62, closure cap \$20 is unifreeded and removed. thereby rotating powder housing 20 back 190° so as is align venturi conduit 64 with pretured does hole 184, 25 ready for inhabition. At this time, parel 654 is retacted one increment, whereby the next number "198" is disclosed durough window 200. When all 200 doese have been used, dose limiting tab 652 of intermittent country ring 620 stude souther docume firster tab 336 of adaptor 320 . to prevent harmer actation for dispensing. Accordingly, the numbers will not continue from "CO" to "190". [2782] Having described specific preferred embodigoards of the Invention with reference to the accomparying drawings, it will be appreciated that the present . At

invention is not limited to those procine embodiments,

1. A powder inteller comprising:

succes means:

masos includios:

base messa for supporting components; expoly means for holding a supply of powdered metertal to be

dimensed. an inhalden conduit extending in a first direction and positioned in displaced relation to said

sheers for carrying a predstanning amount of said postered metalal from said excely theens to said inhalation conduit; nozzie meens for reducing particle sizes of agglameratus of powdered material from the inbelation conduit to form micronitized proudered.

material and for mixing unid discretized pow-

dured material with suction air; said nozzie

casely means for changing the direction of One of said powder from said first direction of said inhalation conduit to a second direction offerers from east first describe. said cartly means being daffeed by a top and and a old commutation a parishery of said top wall, said top well harden an opening thereits

cutt makes for extendedly continuously changing the direction of flow of said powthat in ealth second direction in said curry

chinney means excending from said top princes they at nothing refounding at their for changing the cirection of Dow of said powder from said second direction of said coulty means reductor timely back to east first deuction, selli chimney menne extending along an exial direction thereof; and closure-cap means for covering said supply mesos and polizie masha:

characterized by each chimney means including an ioner booker und curtace basing irregularities extending in said extal direction.

- 2. The powder behales according to claim 1, characterized by said irregularities being formed by a plurafty of flates on said inner tabular well ourface.
- 3. The position introduce exceeding to chairs 2, character tertized by said flates being formed by:

a plurality of limi concerns well sections extending in said axial direction and having an arc of a first radius in a direction transverse to said estal direction, and

a plurality of second well sections extending in anid axial direction and interconnecting said first concess wall sections.

- 4. The powder inhaler eccording to claim 3, charactertraid by said second wat sections having a concare configuration having an art of a second rachus In a chrection transverse to eald axial direction, said second racks being greater than said first racks.
- S. The powder inheliar according to chain 1, chameterband by said top well having a circular shape and enid opening being centrally located in sold top wall, and said swift means including a curved wall astending from sold opening to sold abld.
- 6. The powder inhalar according to chain 5, chatastfactored by said curved wall extending in a substantiefly exist frames.
- 7. The powder lightler according to claim 6, charac-

fertred by said curved and being connected with

- 8. The powder intraler according to chairs 1, cherestfestived by epidetainmay means having a central asin and said intelation conduit having a careful gain perallel to and other from the control axis of said Chicana manna.
- 9. The powder interior according to chains 1, characo. 19 terfood by:

(a) said supply creams comprising:

P reen a galaxiant trasers galaxied retwood voir body holding a expply of powdered material to be dispensed, seld powder housing means further including said inhelettes court it and

e driving body (120) secured to eald reser. # wolr body for driving said reservoir body in a retational direction, eaid driving body inclothing a plurality of recesses in an apper portion Cursof; and

(b) said means for carrying said predetermined amount of eald powdered metarial including.

matering plate means (180) for holders a * - Ingland benefored faile to Ingone benefore el, seid metering place means including makered does note means for holding said frataria beneficial to saccora beneficial at, exis meaning plate means being positionable below askit supply of powdered #9 material, and said matering plate means and said courter boucher means being relattenty bi-directionally extende with respect to each other about a common contral axis so that said matered dose hole . means can be placed in this communities tion adaptively with said expply of powdured metarini or said inhabition conduct;

(c) a spring means (200) blasting said metaring 45 Obce means and said powder housing means toward each other, and

(d) said suzzle means being mounted to said driving body for receiving said metured errount. of said powdered material through said inhaletion conduit, said nozzle meene including rib theens welded in said recesses of eath district body.

farfred by eald driving body having a top wall, and and recesses being erranged along a perpheral Age qui biss to noting

- 19. The presider influsion according to claim 10, characfurthed by said top wall having a circular configuaction, and said recesses being arranged along a common circle in said peripheral poston of said discafe to mil.
- 12. The previous behavior according to chairs 9, characfaritzed by at least one of said recesses extended for a different length then enotion of said recesses, and said ith immes having laughts corresponding to respective cores of early recesses.
- 13. The powder blocker according to claim \$, charmotertand by each its means and said diving body befor conduction a place material, and sale do mans the to sesson ties of button vitalinaries gried driving body such that the pleate material of midthe seams is found but the plants margins of eald
- 14. The powder inhalar according to chain 8, charactestand by:

easid diving body including at least one driving recess with a spring larger (183) in each driving

an adapter non-relatibily mounted with respect to said metering plate means, said adapter inchading at least one locking recess for receiving said at least one makes from themis to prevent rotation of said powder bousing means relative to said adapter and said matering plate meens;

acid cleaves can areans including priming meens for rotating said powder bousing means each that said intratation conduit is in commuensure with each metered does hale means when said closure cap means is removed from covering relation of each powder housing means and for rotating said powder housing course much that said inhabition conduit in out of communication with said maternal does hole means when exit closure cap means is secured in covering relation to said powder housing means, said priming means including at least one priving rip for blasing said at least gribbol are tuest to bias to two regrit gritiques eno recess of seld adapter to enable rotation of sold posedus housing meura relativa to said matering plate means and for engaging with eald at least one driving recess to rotate sold powder edate privaters these as existent ensuring place

19. The powder inhaler eccording to claim 9, character 55 15. The powder inhaler according to chira 14, character testand by said driving body including two districtstealy apposits spring linguis, said adapter including two dismetrically appeals locking recesses and

21

EP 0 883 415 B1

exid cap messes including at bear two dismetrically appashe primag rbs.

- 18. The powder inhaler according to claim 14, charactertied by each printing to including an upper ramp . portion and a forest ramp portion which metil at the intermediate projecting posters and reduce in thickcose no they show many from add projecting perton, each that exist upper ramp portion initially bisees said at bear one spring linger out of said at ... 19 Jeeps one locking recess during removal of said dissure cap means from said covering relation and said lower camp portion initially bissons said at least one apring tinger out of said at least one locking reto said covering relation.
- 17. The powder inhaler according to claim 10, pharestertrand by each said spring tagor (183) including a depression which receives said projecting portion. ** when exist change commence is tally secured in said covering relation.
- 18. The powder inteller according to claim 14, charactested by said driving body including two discretrically apposits driving recesses and two spring fogars extending within exit two chilling recesses in an unblesed condition.
- 18. The puredur between according to claim 14, characo. 🙉 teritori by,

eaid adapter including at feast one helical care track having a substantially square cross-eartional configuration; and

exid closure cap messa including:

an account gift having an inner applica, at heart pass care formed on a lower portion. 49 of the boars earlies of annulus stati for da-

Cas lacked one tend to bine mide gel

29. The powder inhaler according to chain 19, characbetterd by each said care track including an every portion defining a vertical dray zone in which chid at betal one care expense prior to postalizing helical

to bits differ ones one many to then to prevente

\$1. The powers introduce according to chains 19, characfurther by two of coid before care tracks and two of safe cace.

hatel one can teach.

\$2. The powder lenses according to claim 5, charac-

eald matering plate means being an underside with ribs (herees:

pas permecbio retainer rocene for retaining e breatern blee of letretern breathway bies to sect gried ensure written bins, ensure elect each positioned below said statured does belo

-strawo of bandilacq point entern welster bins printed the to eties and at a action policy rate mason and to sold the thorner and with bine of bethew gried except spristery bine peach that said ribs on hand into each retainer

- case during securement of said closure cap means 19 23. The powder inhalor according to claim 22, characbefore by said retainer means being formed by a material selected from the group correlating of a par-parmentile Star, a cresh screen, a persus meterial must and a perforated plate electronic.
 - 24. The powder labellar according to chain 22, characfurthed by entiretainer means butto ultrasonically edis bles ed heiden
 - 23. The powder inheter according to chain 22, charge tertain by said ribs being formed in a plansity of appeal agest, concentric circles.
 - \$5. The powder inhalar according to chairs \$2, characterized by each rib having a substantially biorgains cross-sectional configuration.
 - 27. The proder interior according to chairs 22, chairmtertized by eald metaring plate and sald gas pattreable retainer being formed by the stape of:

positioning the gas permeable retainer at a prend passings in a first could had wood for Injustice matching sald metaring platter,

postbyring a second codd bell adjaced anti-Cost mosts had to form a model on chamber them. etutines used for bijection conting said cosuring plaza, solid ascend excit half having a these distribution of mission principal edge each Marie el estil producusions postero la esid

Cost profit helf.

bearing actes pin through tall through openhas in said second social trail into evenous with said retainer to bold the retainer its position ecuinal said first excel built and to form a metered done boto in said maked makeing plate;

injuring place manded into anid exciting character Colougo at hund one bejection past to then said property place with mild commend DEPLOYE SHIPS VARIOUS SIZE CAR SIZE SAICHES to an underside of unit contenton office is onecting relations to solid engagered chann halfs.

FP 0 683 415 R1

22

- 23. The trethod of claim 27, characterized by said molded metering plate having a shallow recess. formed at the underside thereof in surrounding relation to the metared does hale, and said powder estainer beeing dimensions prester than said mebared dose bein to completely cover said metared does hate and less than said shafow recess so a to be secured to said matering plate in said shellow
- 29. The powder letheler excording to claim 9, charactectpod by said base means including:

a base having an existly extending ratifying post thereon counted with said common ands #5 and non-rotatably connected with said metering plate means; and

Dies no Destroin videados, rouses en esid printers bies et acquire princettes el asad cost, for providing a visual court of the number - # of dames of said postered material that have been dispensed or supplie to be dispensed in eroquian to mixture evitation of mixtures der housing means and said metering plate means, said counter means including:

> counter ring means for providing said visuni count, anid country don coasta balan etra terated dominion bies Junda eldelator playing said visual court, raid country ring crease includors

& continuous counter sing having counting indicts thereon and goer # with formed theresenand on an immer seriace thereof, and

an intermitant counter sing country recorded with early confinences counter day and healing counting todays there. on and past back formed fluorescend on an inver surface thereof.

duples stresse Brough which can of said D gris various bies most eichtei gesteines courses in chaptered to indicate a court conresponding to a matter of cooks of powdared material that have been department or ruccels to be dispersed, and

extracting means for incrementally retailing. mid counter day means in exposes to cold schools extend between said color-Deligion vectors best bear arment state out ments, said according means extending pend proper excepting with cald gast back. Of of said conductors country tog and said interroties coulde ing terroting with conthere exercise day one increment each

time that a done of the powdered material is depended to display another one of said counting indicin of unit continuous counting ring through said display means, and for mturning said intermittant counter ring one increature every predetermined extriber of retational increments of stale continues counter ring to display another one of said counting indicin of said intermitant counter ring Prough said display means, said paul meene includires:

on outer wall having an outer austice and an inner eurisca,

a pend, triagrapy moided as a single place with the outer surface of said outer well, for engagement within the guer texts at one of said continuous country ring and said breamstern COLUMN TOO, AND

a panel spring, irragrafy molded on A single place with the later surface of mid outer well, for thesing said part into angagement with said goor treth of said continuous country risk and said interritant courter day, exist panel appling extending along a garanalle radial directors.

- and having country indicis thereon for dis- #F 30. The prester inhalist according to child 29, charactertraid by exist paint spring having a generally Lstraped configuration,
 - 21. The previous infinites according to claim 25, chaptertertimal by said pand spring having a garacally linest configuration and extending at an arcte from the laws surface of said outer well.
 - 22. The provider behalve according to claim 25, charactestand by said pand spring banking one and integrady content with an apper parties of said invemoor of mideral wall.
 - \$3. The powder bibates according to chain 28, charactechnology and good took of anister throates comэм гінд Бийнд актродикі ін солтакропсінного місь дайві counting landers thereon, and salet goar teach of each interestant counter this being arranged in comappropercy with early counting indice therein.
 - 34. The presider intention excepting to chairs 25, chemisterbad by the goes bads of wint continuous courses pay including a planelty of mechanism has gow many of a first depth and at feast are exceed pour book of a secretal, greater daying, each talk secreta gase tools being positioned after every precision mined curricus of send first good facility and said asterretard country sing including a plantity of exp-

23

creative third good teach of a depth equal to the depth of each said second paor teath of said continuous counter ring so that anid post engages with exercesive ones of said first gear teeth during euccessive during operations and engages with one said secand goer tooth and a third goer tooth of said interinitians country sing other a plumity of the dooing sperations.

- 25. The powder inhalar according to claim 25, character. terized by sald accessing means hether including pend driver creams for incrementally extering said والمستعدد وموده ترمين المدور المعادد المدورة taker resulably requested on eald been consistly with sald continuous courter mg and said infamiliant. 15 counter throughly retainer including first panel driver meens for engaging with one elde of self paul means to incrementally states said pend means in a first retational direction at the end of rotation of anid receiver in exist first receivered direction and ago. and peel driver means for engaging an apposite elds of unit pand means to incrementally rotate said peut meene in a second, opposta rotational discotion at the end of exterior of said retainer in said said end, opposite rotational direction.
- 36. The powder inheler according to claim 23, charactertred by suit indicis being oriented in an axial direction of each intrafer so that each indicin can be med when said interior is vertically trimeted.
- 37. A powder inhaber according to chains 1 comprising:
 - powder housing means (20) including sald outphymaens (20) and said inhalation conduit (88). the powder housing means further comprising :

a reservoir body including a supply of powdered metadal (82) and

- a datable body (120) secured to said reserwair body for driving exist reservoir body in a rotational direction, said driving body in
 - a plurality of recesses in an upper porton therect
- et least one diving recess in a lower corden thereof; and
- a spring finger in each said driving re-

wherein said means for carrying (180) comprises:

metering plate means (180) for holding a metured amount of said powdered meterial, said - 25 makering plate answer including metered dose hele means for holding said metered arrount of sald powdered material, sald metading plate

means being posidirable being enid supply of pandered material, and said metering piece great and said powder housing meens being setatively til-directionally substable with respect to each other about a common curaral axis so that said matered does hole means can be placed in field communication selectively with said supply of powdered material or said intetestion constall, ealth matering plate means havprogram acts day extracted on grey

gas permeable retainer means for retaining a dose of eald pointored material to eald material does tests means, sold retainer means being positioned below eald metered does hate means and in everying relation to the underthe of said matering plate means and to said the thereos, said retainer means being welded to said ribe each that said ribe are fused into cold establish manufall

socion massa (290) for blastro said meterino place meens and exit powder bousing itmans toward each other;

wherein size of butteron of steppin pixton bias glossely ing body and further comprises its means welded in and recesses of said driving body; the appearance further comprising:

> an adapter con-rotatebly mounted with respect to said metadag plate mesne, said edepter inchicker

at least one locking recess for receiving said at least one spring finger therein to present rotation of said position freezeng maure relative to said adapter and said metering pittle means, and

at least one helical carn track having a substantially equare cross-sectional configu-

obusio sold dopus cap matrix (\$20) la attangad for printing east powder inhalar for use, east chause cap means including:

printing means for rotating add powder housing means such that said inhetation conduit in in elod each besstern bles rith animals does bele channes when eald closure cap means in removed from covering relation of eald powder bousing means and for rotating sold powder bouring means such that said inhabition condult is out of porynumication with said meterad dose hole mashs when said closure cap means is excured in covering relation to said powder bousing means, said printing means including at least one priming its for timeing east at least one spring tinger out of askid at least one lociding

EP 0 833 415 B1 52

23

Fautrichtung des Pulvers aus der entten Pitchama der Inhebstansleitung in eine zweits, von der ertige Richtung verschiedans Richtung, wobel die Hohlmanselnricrasing diserch eine Observend und eine mit. 🔮 den Rend der Cherwand verbundenen Marant definiert ist, wobei die Obermend alne OZnana dada bet.

eine Witseleinfattung, um die Fliebfah- 20 tong dee Pulvers in Weeentlichen Insutmojudich in die zweite Richtung in der Hobimunicipations as federa, and

also Abhugueinskittung, die von der oberan Wand die Öllnung umgebend ausgehlt. un de Fleitrictung des Paleurs von der produce Richtung der Hobbaumeierichtung im Weenstlichen zurück in die erste Richtung zu Anders, wobei die Abzugseinrich- 39 tung entlang einer existen Richtung derem vertibilit, and

aine Verschlandspeneitrichtung zum Abduction dur Zufahreitrichtung und der 25 COmments in the comments of th

dadesch getabezakhoet, dass die Abzagseisrictoring eine betere richterführzige Wandscherfüche umtaust, die in die ariele Richtung vertaufende. M Urregeimiöligkallen aufweist.

- 2. Polyarishabitor each Asspruch 1, disdorch pabanasakhost, dans de Urregetniäigkeise durch also Visitanti spe an der inneren ettereriberigen Westsbertliche gebätzten Fillen gebildt ist.
- 1. Advantabalister much Asspruch Z, dadorch gekannzalczout, daes de Allen gebildet első derült:

oine Materati von grant terrigoen Watchibactinities, die sich in der actalen Richtung deconcluse and aireas Bagan and eintern errore Rodies in einer Radioseg sentracht zu der azielen. Richterto habes, and

eite Velzehl von zuelte Wechstechniten, the sich in the actions flicturing protection and de entre kontavya Wandsbecholita missinender enchinden.

4. Polyacomicator mach Assprach 3, disdorch gotemezekelent, dess de rentan Mandebechelbe elle kuntave Germit beten mit elegre Bonne mit elmorn zweczen Raction in elmo Flictcusty annibuschi 🥨 20 der antelen Pichtung, uchei der zweite Racken. gritter als dur erate Radus lat.

- 6. Pulverinhelator cach Anspruch 1, dadurch geteanzalchaet, dess de Oberwand Kreistom hat und die Ölüsing zestral in der Oberwend engeordnet lid, und daze die Wildeleinschtung eine getrünning Wand underst, die von des Öffnung zum Martini verticals.
- 6. Pubmishabase each Associats 5. dudusch cotennzeichnet, dass die gekrümme Wand im Weperdiction in spiral bridger Weise workfull.
- 7. Pubrasistations such Assoruch 5. dedutch sakannzaichnet, dass de gelrütterte Wand mit der Oberwand verbunden kt.
- & Publisheber nech Arecruch 1, dadosch gabannzeichnet, dass die Abzugseinstatung eine Michigana hat und die Inhebsterschilbung eine Mawhiches but, die perallel und verestit zu der Mittelactes der Abzugseinschtung Begt.
- S. Palverishabitor much Ampriati 1, dedurch gestrictest, dans

(a) de Zuhtenhvicttung eutenjat;

aine Prévernablementations, de aines erroktüper undasst, der einen Vorst von abzugebendem pulverförmigen Materist benefitiel, wobel die Pulverpahliestaliniciony lenar dia inhalderatatany undasst, und

does Astrobekörper (120), der an dem Reservoirt.Orper belessligt ist, are dut Reservoirtôrper in Rotationerlottung accotrabes, water the Astrictations also Metazati von Aumetanutzen in seinen obsom Barnich suferaist und

(b) de Eintstang zum Überläferen einer vogagebunen klange des pelverfössrigen Materials automit

else Azmençhizmeintching (180), un dhe abgemessine Merge des pulierförcrigan Macacata za ballan, wobal da Abammaphataneindatang eine Aufrehro-Inchesiosicitizary file elice et percensure Denis Anto Barellonium del aboressonom Menge das pubestiranigen Makeriels estworld, extrai die Atmoscopte@preihitchantg unter data Vorral des pulsarifrazione Matertals positionischer ist und wabei die Abmanufacturalisticing and de Polestjotribute distriction of the second Richtsonри рересемент ил его рателили Michigan grater and so date do Astrecast of said advator to wrable rotation of said powder housing means religive to said metering piece means and for engaging with said at least one didving recess to rutate said powder housing means relative to said metering plate.

An encutar skirt being an inner author; and at heat one care formed on a lower portion of the inner surface of annular start for dding with-In said at heat one below care track:

wherein said been meen has an arially estanding retaining post thereon consist with existenment cois and non-rotatably connected with eald metaring plate means, the apparatus further compdelegs

counter means, rotatably mounted on said printers bies at notation printers of each post, for providing a visual court of the number of dones of said powdered meterful that have been dispensed or remain to be obspecsed in response to sold relative rotation of said powder housing means and said metaling plate means, east counter means including:

counter ring means for providing said visusi count, said counter ring means being retatable about said convince cardral axis and having counting indicis thereon for displaying said visual court, said counter ring 49 Petastanaprüche meers including

e continuous counter ring having counting indicis thereon and gase teeth formed therearound on an inner 25 confece thereof and

an intermittent counter ring countrily mounted with said continuous counter ring and having counting todals thereon and goer teeth formed thereevound. 49 on an inner systems thereof;

display means through which one of eald counting indices from said counter ring masks is displayed to indicate a court corresponding to a custom of does of poudered metadal that have been dispersed or remain to be dispersed; and

actuating means for incrementally rotating seld courter ring meens in response to 🛲 sales mission retailed negative relation fales. ing plate means and said powder bousing means, said actuating means including pend means engaging with said gear testh of axid continuous counter sing and eald intermittent counter ring for rotating said con-Drucus counter ring one increment each time that a close of the positioned costarial

is dispersed to display another one of said counting Indicin of salid continuous courter ring through said daptay means, and for retaking sold intermittent powerer sing one in-Criment every predictermined cumber of autoriano bien la emergeré lancitatos courses sing to display another one of said country indicts of sald leternitiers country ring Dannigh said display means, said pawl manns including:

> an outer wall having an outer earliest ಆನೆ ಜ ಕಾರ ಅನೆಯ,

a pant, integrally melded as a single piece with the outer surface of eald outer well, for encomment within the gear teeth of one of seld continuous

counter ring and said interrelization

COURTER (PO). a pant spring, integrally moleted as a single place with the inner surface of said outer well, for blasting said powf chears into angagement with said goor tech of said continuous country that and said intermittent counter ring, said pawl spring estanding slong a generabs racht direction.

1. Pubendahebeter mit:

einer Besteelnrichtung zum Tracen von Komponertes,

einer Zuführeihrichtung zum Bereitheiten eines Vorrets von putverlörmigern Material, das aus-Zuceben lat.

einer Interletionstellung, die in eine erste Richtung vedicit and versital gegenither der Zufull-reinfichtung positioniert let.

einer Einrichtung zum Übertühren einer vorgegebenen Menge des pulverförmigen Materials aus der Zuchtrahrichtung in die Inheistionstel-

einer Düseneitstatung zum Reduzieren von Tallchengrößen von Agglomeratan des pulverl'émigen léxterisis que der Inhalstinnstellung, um miluonialertae puhrerförmiges Material zu bilden und um das mitronisierte pulverförmige Material mit Sauglatt zu vermischen, wobel die Olivershrichtung aufwelst:

eine Hoteksameinsichtung zum Ändern der

EP 0 883 415 B1

25

naturalischeinrichtung für die abgemesse ne Doels aucedather in Ruktverbindung bringbar ist mit dam Vorrat des pulverlörmigen Materials oder mit der Ashelictore-**Informa**

63

(c) one Federalisticitising (200), die die Abmesaphteneinfeltung und die Polvergehliesseinriciting urtar Vorspanning adalmination to

(d) die Düserskrichtung an dem Antristischerper engebracks let, um die abgemessene Menge des peiverfärmigen Materials durch die inheiztensleitung aufzuherzten, wobel die CO-19 sensinschang Ricogneinrichtungen emtesst. die in den Ausnehmusges des Autnebskörpers einceschweißt eind.

- 10. Pulvertriebster nech Arepruch 9, dadusch ge- 20 transcalchest, dues der Archiebeldsper eine obere Wand hat und die Ausnehmungen arthre einen Randbereiche der oberen Wand angeordnet nind.
- 11. Pulvarirhalator nach Anspruch 10, dedorch go-Innermalment, their the chare Ward also breitforsnige Gestall had and die Assmetimungen entlang eines gemeinsernen Kreises im Flanchereich der breichtnigen oberen Wand angeordnet eind.
- 12. Pulverhillator mich Ampruch B, dedusch ge-Immeralcheel, dans werigstere eine der Auszehcrampen sich Ober eine andere Länge als eine andura der Ausnahmungen agstrackt und dass die Rippereinschtungen Längun heben, die den jewei- 25 Egen Lången der Aussehmangen entsprechen.
- 13. Poliuministator nach Acequich 9, dedusch opbanconictores, dans die Riccaralivictoreum und der Anthibitärper ein einem Kriedmütinitertel 💝 harquetell nind und dess de Ripperwintettungen durch Utranchelbetreeiten is des Auswehrengen des Antristetifiques verschweißt eind, es dass das Contactificatorial der Represidenteurgen mit den Kunstmöttetend der Augusbrungen von 4 actionalities lat.

14. Poheditelitar tech Arepruch S, dedesch gir-

immercalchesat, dans

der Anthibitätyper wenigstere nice Anthibitateautonomy still einnen Federloger (163) is jeder Abfenery unlaws ein Adepter elchtdeboer in Bezog auf die Abroteephateanshetchang angebracht let, echalder Adapter workpitans one Vertegetingsationerrang # zum Acthebmen des werigdens einen Federingars dark authorist, was eles Dreburg our Publis-

petallupeelietstung in Bezog auf den Adepter und

de Abmeesphitteneinrichtung ze verhinders, und de Verachkuskappenehrichtung eine Vorbereitungselnrichtung zum Drehen der Pulvergehlerequirytetating in der Weise aufweist, dass die Inhainfondating in Verbinium mit der Lochehrichtung für die abgemessene Doels ist, wenn die Verachtuestappensitricitium; aus der abdeckenden Beziehung von der Pulvergehäussehrlichtung unb funt while, and zum Drehen der Puhrergehiltenseinrichtung in der Weise, dass die Inhalstismstellung miller Verbindung mit der Locheinrichtung für die abgamesserie Dosis gabracht wird, wano die Varactionstancenellarizations in die abdoctusses Bezistung auf der Pulvergehäussekrichtung befestigs wird, wobel die Vorbereitungseinsichtung wenighters eine Vorbweitungsdape sandapst, um den werkstens einen Federlager aus der werägstern einen Verdecokmonauswahrtung das Adectors Zu difficient, um die Distang der Putrempatikanssindictions relativity dur Abmessplatieneleichtung zu embglichen, und um in de wenigstens einen Az-Maceauenetenung einzegreifen, wit die Pulvergenieredistrieren van es viitain gruntzinierenier richtung zu drohen.

- 13. Puberfobelety such Avenuch 14, dadarch nebywiczelchnet, dass der Arthebithätter zwei demetral gegen@bertegende Federfrager autwebt, echel der Adepter zwei demetral gegenüberte percie Verlegiturgezonelmungen bat und die Verschied approximations wenighters and demetral gegenüberlegende Füßrippen hat.
- 18. Pulverbitabilitir cach Amprich 14, dadurch getaxezaichest, dans jude Führippe einem oberen Remonitorisch und einen untzuge Ramparbareich hat, die sich in einem mitteren vorcabenden Bewith tritlen and tall tyrestmenter Enterming von dum verstahenden Bereich in ihrer Dicke schnelcase, so data dar obere Recognismente zamliches den wenigstens einen Federlinger aus der wenigstate eines Versingsburgsburgsburge selbsend dos Estamens der Verschlunksposseinschang and the abdrebandon Bezoelego herapadolast and the uniters Plantpared victoring translated data waster cases sixen Federilitger and the westigations alone Vertegebrigstetteltrang willrund der Beleckgung der Verschlenkappenehrlichtigig in die abdeclarede Stefang heraced/Octs.
- 17, Publishabitar texts Amprich 18, chicked gahungarkhout, dans judas Pedastropus (162) aine Versiebre tre, de des vortestements Deseits ausestrol, estre de Verschleskappenskrichtung in economies (Salang waterlands between let.
- 18. Publishment coch Anspecta 14, dadesch geimmeratebant, dans der Anthopiorper zuel de-

enekteli gagenüberhagenda Artelabassanstatusgan and awai Federlinger unrinest, the cater nicht vorgespennten Bedingungen lenerneth der belden Astrializamentalizadoses vacinarios.

18. Pulverinheister nach Anspruch 14, dedurch gebarezelchnet, daes der Adapter wenigstens eine spiralförmige Steuerbehn mit einer im Wasserlichen quedredechen Overactivity extelling hat, and

de Verschänstangeneierichgen aufweist. einen deglössigen Marad mit einer inneren

Oberfräche, und

werigstass einen Hocken, der en einem unteren Sereich der inneren Obertiliche des ringlötcrippe filterests goodstat ist, ure in der wenigstans einen spiratärmigen Stauerbeten zu Ins-

- 20. Publishmizter much Asserted 19. disdusch cotunntektingt, dass jede Steachelin einen Eintriciburaich has die eine verticale Falkome deliniet, in de der werigetate eine Nockan eingreit, 🙉 bevor sine spiratômiqu Bevegung dan wenigatens einen Nockane innerhalb der wenigstams einen Streetheise zugelessen wird.
- 21. Pulverinbelder neck Ampruch 19, dedusch gehannzalchnel, dass zwei spiralberrige Steverbebseen und zwei Nocken verhanden eind.
- 22. Pulverhibetor nach Amenich P, dedurch getennzalchnet, dess de Abmassolutionalinistico eine Univente tot
 - Rippen dayard has eine geschrechtische Haltseinschnung zum Heiten einer Doxis des pulvertättrigen Matedate in der Lochainrichturo Sir die abnamessere Dosis von 49 hunden ist, wobel die Hebesinfehrungen unter der Locheinstatung für die abgemessene Docis poel-Contact let.
 - de Habseinrichtung in Oberdeckander Beziehung zur Untereite des Abmesschichenbeldetung und 49 den Fünnen deren positionleit ist, und de Habseinfottung so as de Rippen geschweißt. ist, dass die Ricpen in die Heitseiertstung eingeachipolous sind.
- 23, Pulvarinhabitor sach Anapruch 22, dedesch gebannzakehnet, dass die Haltseinrictsung aus alnera Matariel hergestellt ist, das eus der Gruppe bestateed are einem geschirchlissigen Filter, einem Sinhoweste, whem Sich amporteem Meterletund 45 ginern Lacticistanskovert sungweißt ist.
- 24. Pubrantzhalator nach Americh 22., dadorch ge-

beautalchest, daze de Hacesbrichtung durch Utrachetechuniönn mit den Riccen verbunden let.

- 25, Publishedator mech Amproch 22, dadurch gatannzalchaet, dese de Rippen sis Vetraté von bestutzedetze, konzentrischen Kreisen gebildet
- 25. Polyarizhgiater each Arapropi 22, dadarch ga-Incurrichmet, dans jude Ptopo also im Wearstithen dejection Querichnith postalt hat.
- 27. Pulverichalizor nach Amprisch 22, dedurch gennunichant, days die Ahmeesplate und die gaeduchlissing Haltweinfeldung durch Erigende Schritte gebildet stret.

Postionioren der geschschaksigen Hataulerichtung en einer vorgegebenen Position in einet exten Fornhälte, die zum Softroleben der Abmesschatte verwendet wird.

Postionieren einer zweiten Fontställte engrenand an de exte Formhille, um eine Formbyenner dezwiechen zu bilden, die zum Spritzoleden der Abmessphille verwendet wird, wobal die zweite Formhälte eine durchgehende Öllnung in Americhtung mit der Hatseinrichtung an der vorgegebenen Position in der ersten Formhälte hat,

Einsetzen eines Kernstiffts durch die Öffnung in der zweitze Formhälts in Eingriff mit der Heitealoristicus, um die Haltseinrichtung in Poaltion gages die erste Fermhälte zu helten und um ein Lock für eine abgemessene Dosis in der gegossenen Ahmensphilite zu bilden, und

Sprizen von Konststoffmeteriel in die Formkumper duch verigstans einen Einsprätzusestributa, um che Abronassphatta artis dom Loch (Or dis abcomessage Dools und stit der Haltzeinrictaung befestigt an der Unterneite der Altmeesplate in Oberdeckender Beziehung mit dem Lock für die abgemessene Doels zu bilden.

28. Pulredinhelator nuch Anspruch 27, dadurch peessichnet, dass de pagossene Atmesspistie eine fleche Verügtung gebildet an ihrer Unterseite in umgebender Buziehung mit dem Lech für die abgemeseane Doels hat und dass die Pulverhaltseindiching eine größere Ausdehnung ale des Loch für de abpernessene Docts het, um das Lock für die ebgamessone Dosis vollstårning zu bedecken, und peringere Atmessurigen die die Rache Versiebung hat, um as an der Abmessphalte in der Bachon Verdufung befortlyt its seln.

29. Pulvarintalistor mech Anspruch 9, dodesth gatantizatzheat, daes die Bashainriztium aufweist

> dine State and minute exted vertex denotes Marke-Zupfen darsuf, der kondet mit der gemeinen. men Achee ist und nichtlichehber mit der Abmesepistaneiskistung verbunden ict, und

eine Zählereitetstang, die dreitber an der Baels in umgebender Bedehung mit dem Halte- 16 zaplen encetracté let, usz in Realition out die relicive Drahung dar Palvergebiluseeinstabtung und der Abmosspieltsseihrichtung, eine visualle Zähkung der Azzahli von Dosen des pulverförmissen Materials zu Beiern, die abgege- 18 ben wurden oder die noch abgegeben werden können, wobei die Zählerskrichtung undanst:

eine Zähleringsbrichtung, um die visuelle Zähking zu Beters, wobel die Zählentin- 20 pelotations um de pemelosame Mittalection that bar let and Zittopantierunces thren het, um die visuelle Zählung exzuzeigen, wobei die Zählentegeinrichtung LETTERET:

einen kostinulerlichen Zählerstog mit Zählmertierungen derzuf und mit en seiner Innestiliche unieufend engeordnetse Zähnen, und

einen intermittlerenden Zilbferring, der toucial mit dara tentinuterichen Zilblearing angebrack) ist and daran angebracità Zibhnerideningen unzi Zibne 😊 authorist, the unfautend an elver toneolitiche davon angeordnet sind,

eine Anzeigseinsichtung, durch die eine der Zilbimertierungen der Zähleningelorichtung angezeigt wird, umeine Zättlung entsprechend einer Aszahl von Dosen das pulverförmigen Materiale auzuzeigen, die gespendet worden aind oder the noch zu spenden sind, und

eine Betätigungseinrichtung zum echstäweisen Weiterdrehen der Zählerfregelarichtung in Reektion auf die relative Drehung zwischen der Abmesspetteneissichtung und der Pulvergo-Missosin/ichtung, wobel die Betätigungseinrichtung eine Kilminnelerichtung umfaset, die mit des Zübnen des kontissinüches Züblerrings und des interrationenden Zählenlags eingraft, um den kontinuierlichen Zählenbig einen Schott welter zu drehen, jedes Mei weren eine 🧀 Dazis des pulverförmigen Materials gespendet wird, um eine endere der Zibbnunklerungen des kontinuerlichen Zählerrings durch die An-

teignehritztung enzuzeigen, und um den intermitilerenden Zählerring bei jeder vorpageberen Arzeld von Draftseverungsschriften des kontinuierlichen Zählerrings einen Schrift weiter zu dreben, um eine andere der Zättmer-Herungen des Intermitierenden Zählerdnet durch de Anzeloseinstatung enzuzeigen, wobei die Klinkeneitrichtung stribest:

sine Bulbare Wand mit einer Bulbaren Ober-Diche und einer inneren Cherbiche.

eine Klinke, die einenlichtig mit der Außeren Oberfläche der Buberen Wand gegossen his, sum Engriff mit den Zildenen von einem uca dam honfosisticten Zättenten und dem intermittierenden Zäränning, und

sine Kintersector, the straticity als els-Stück mit der inneren Oberfläche der Bu-Beren Wand gegoesee lit, um de Kinhe im Eingrill and den Zähnen des kontinuler-Bohen Zählentings und des Intermitterenden Zählerringe zu deOcken, wobel die Kitokunteder eich entlang einer ellgemeinen radiales Richtung entreckt.

- 30. Polverkshebstor mech Amerikato ZP, dadurch gehannzeichnet, dass die Klinkardsder eine aftermein L-förmige Gestall hat.
- \$1. Pulverhibutator nuch Anaprack 29, dedutch gahanszeichnet, dese die Klistzefeder eine allenmein linears Gestalt hat und sich in einem Winkel von der inneren Oberfährte der äußeren Wand er-
- 32. Pulvetebabtor nach Ansprach 29, dadarch gahannenichmet, dans die Künkersieder ein Ende hat, das einstückig mit einers oberen Bereich der inneren Chertische der Außerwand gogossen ist.
- 33. Pubrarizhalator each Asspruch 29, disdurch ga-Asserzeichnet, dass die Zähne des terrinderichen Zählentres korresponderend mit den Zählmerklerungen daran angeordnet sind und dass die Zähne des intermitierenden Zählerrings korrespenderend mit des Zibbmertiensnose dans apgoordnet sind.
- \$4. Pulverinheister nach Anspruch 29, deckurch gehangsichnet, dass de Zibne des tortheierichen Zählersings eine Matezahl von sufeinendertolgenden ersten Zähnen einer ersten Tiele und webigstens einen zweiten Zabn einer zweiten, gelderan Tiete urritment, wobei jeder zweite Zieten tekster Jader vorgegebenen Anzabi von ersten Zähnen angeordnut bit, und dass der intermittlerende Zähler-

EP 0 883 415 81

trining accomplishments.

wobel die Einfahlung zum Übertragen (180) auf-

einen Federlinger in jeder der An-

spieConsireicStung (190) zum De ind left egrald nanessampes ranie nationies verlämiges Materials, wobei die Abmesspittitanalivictimg einer Locheinrichtung für eine abgemessere Doels zura Bereithaften der abnenen Menge des pulvertirmigen Metsdata sufresist, wobel die Abmesspielteneinrichtung unter dera Vorret des pelverförmigen Matadala nactioniumar let und webal die Abmasaphilipsolivications and the Pulveryat-Buseainrichtung relatir is zwei Pitztangen gegeneinander um eine gemeinenne Mitalathee dabbur sind, so does die Lacheinrichtung für die abone Dorte assessibles Fluidrerbindung bringber let mit der Zulübr des pulvertiernigen Materials oder mit der Inbelationstelluno, wobei die Abmessphilleneinsktitung Rippen en örer Urtersets hat.

eine geschrichliesige Haltseerlichtung imm Haten einer Dosie des pulvertörmigen Materials in der Locheinrichtung für die abgemessene Ocale, wobel die Habseltrichtung unter der Lockebrichtung für die abgemassene Doels end in überdeckunder Beziehung en der Unterealth day Alarescopic predictions and an dan Rippen daran angucronat let, wobai die Halisélectritung és de Rippen paschutálit kt. so date die Rypen in die Halbeindchung eingeactinobas abut

eine Federeisteldung (2008, die die Abmessplacemeloricitating and die Pulvergenikunteinnicitizing enter Vompenciang autoimender 20

rectui du Dünemindstäung en dam Antriatel/Erper angebracht ist und farmer Pippermierichtungen aufweich, die in die Ausmehmungen des Anthobeldeper geschweiß sind.

water de Varrichtung weber aufweist:

einen Actictes, der nichtstretter in Dezug auf de Atmesphoenelnichtung angetrecht ist, websi der Adepter umfantt.

wedgeters sine Verlagskagssconelenerg zom Authebreien das wenigsbete dicon Federángos carte, um de Deburg Our Patracyat-Bosoniastchtung deleter its ONE ACTION AND ON ACTIONS LECTRICAL EXPONENCE PLANS

wentpities eine aplasförrige Status-

EP 0 883 415 B1

bets, die eine im Wesentlichen quadratische Queracteritzgestattung hat,

wobel die Verschiesskappeneitrichtung (520) daze auropastabat ist, um den Pulverinteletter für den Betrich vorzubereiten, wichel die Verschäusstreppen-

eine Worbereitungseinsichtung zum Drehen der Publisgehäuseeinrichtung in der Weise, dans 19 die Inhebitionsleitung in Verbindung mit der Lacheimichtung für die abgemessene Oosla lat, wann die Verschlusskappeneitwichtung aus ihrer abdeckenden Beziehung von der Puhrergehiluseeinstatung entless wird, und gum 13 Drehen der Pulvergehäusseinsichtung in der Weise, dass die krheinformleitung außer Verbindung mit der Locheinrichtung für die abgemassage Dock patracts wild, were die Veractiverisopeneinrictoing in de abdelbande 30 Beziehung auf der Pubergebiluseskrichtung behedigt wird, wobel die Vorbereitungseinrichtung werägstern eine Vorbereitungsrippe umlaset, pm den wenigstans einen Federlager eza der verägstere einen Verriegebergsbase- 29 netrneng des Adaptes herauszudiücken, um die Dieleung der Pulvergehillusmeinstattung rees un gruttsferietzignement un un vital móglichen, und um in Eingall mit der wenicstone eines Architessaneivnung zu beten, um 💝 de Polvergetsbusseinstatung retaile zu der Abmesspecialisticities zu dieben,

einen anglössigen Marzai sat einer inneren Oberffiche, und

wanigstone einen Nocken, der an einem UNDran Baraich der inneren Oberfache des ringförerigen Maetals gebildet lict, um in der werigetaca elosa apiraliberigas Sinustadas zo tav- 🛷

uchel de Barbalvistong einer gabit verteiterdan Habezagien daran exflucial, dar knoolel zu dar gemaineemen Achee Begt und nichtsbuhbur mit der 🖽 AbmesspleCanelistchtung verbunden ist, wabei die Vontations water automist

alon Zildenbrickeung, die derbeit an der Beais in ungebender Beziebung mit dem Halte- 🔎 zaplan expetencial ist, sen, in Residion and the relative Distance dur Patricipationnesiscotong and are Alexandric preincipling, eith viscado Záticag der Astratificas Domen von paivertirmigen Material, die abgegeben worden 23 and other the martin abgregation was then before. accurators, extrai die Zibbereinstatung auf-

eine Zählerringelnrichtung, um eine visuelle Zibisno zu Bufura, wobel die Zibbissinpainticitung dration um die pemainserre Action ist und Zählmerkierungen derauf hat, uso die visualie Zilitung enzuzuigen, wobel die Zähleningehrichtung unflasst:

Ø

einen kuntitulerlichen Zättlering mit ZZDárrantównympen daram ond mit an seiner inneren Oberfülche umbulend anguerthatan Zähoon, und

einen intermisierenden Zählenlag, der togrini mit dem kontrulerichen Zühtenting anguordnet list und daran angubrackle Zählmerkierungen und Zähne automist, the artifulanti on eiter itmediche devos acceptant sind.

sine Astrologisticitus, dutch de sine der Zählneddurungen der Zählerringefreichtung angezeigt wird, ook eine Zählung entoprechend alner Anzabi von Dosen von palverförmigern Material enzuzeigen, die gespendet worder aind other dis moch zu appenden verbleiben, und

aina Batikigungsainnichtung zum achritimainen Drehen der Zählerfogefratztung in Residon auf die retaine Dreinung zwiechen der Plettenabmerseinschtung und der Pulvergehäussninrictions, world die Dathigungswirdstamp one Klinkermindsteung unthest, die mit der Zilbren des kontinderkohen Zilberrings und des besonderenden Zählenbes eingraft, um dun burtherandichen Zühlertinn einen Scholl zu dischen, judos bital events eine Doels das pulver-Sharrigum Materials gaspacetat wird, tern often anciere du Záthrustierunges des Instituierschen Zibbertrige durch die Anzeigestreichtung aczuzalym, und um den interstilarenden Zibbering einen Schrift zu drehen, bei jeder vergegebanen Anzahl von Drehectstown des tordinalestates Zinterings, um eine antere der Zühlmerkierungen des Internktierunden Zittierings desch die Antelgesinkblung anzureigne, eccoel de Klinkereinskaltung um-CHEST

> eine Auftere Wand mit einer Bulleren Ober-Cáche und einer inceren Chertische,

white Killman, the elimpicality and that feedbarran Coarticos car Autheren Wand gegossen les, trans Empril and dans Zilliman van eldern von den kontreletisten Zittering und due beamfaireaden Zintering, und

ains (Cirksstades, the electricity als ain

ring also Materials von guistanzierfolgenden diti-

ten Zähnes mit einer Tiefe gleich der Tiefe jedes Zwellen Zahre des konthekellichen Zilbierrings

aufweist, on dass the Klinks mit enfeinanderfolgenden der erzten Zittere während aufeinenderfolgenden Dosierungsoperationen eingraft und sach einem der zweiten Ziltene und einem dritten Zeiten des Intermitterenden Zählentigs eingraft. 25. Pubertriedator nech Americh 26, dadurch geterecontchnet, deue de Betitigungsekrichtung turner eine Klistenartziebeeinsching aufweist, um de Kilmianehvistaung actribueise zu drehen, we-

- bel die Kinkensetriebseinrichtung einen Filing umfacult, dur dreitber an der Basis boardel mit dem boe-Unsiedichen Zilbiering und dem intermittierenden 28 during angebracht ist, websi dar Pangeine arate riebeninschung zum Engelt mit einer Seite der Killekanstreichung zum echtiliseinen 20 Drehen der Klinkeneitstating in eine erste Richtung am Ende dar Destung des Rings in die erste Richtung und eine zweile (Ordenestriebeeiszisttung zum Eingrift mit der gegenlicherlegenden Sete der Klinkeneinstatung aufweist, um die Klinkenein- 29 statum existinging in sing swells, entgagengesetzie Drehrtchsung ern Ends der Drehung dies Filings in the Zweitz, empagarigamentate Direktititung zu drehen.
- 36. Pulvetitheter each Angruch 29, dedurch getenezalchest, dans de Madierurges in einer andales Flictelung des inhabitors oriented sind, so desa de Martierungen gelesen werden bönnen, wene der Indelstor vertikal ausgerlichtet ich.
- 37, Pulverinhelstor each Assorach 1, soc
 - einer Pubergehäussehrichtung (20), die die Zatulovalesteteung (20) und die Intutationelietung (EI) automial, ector die Palvergetriesocializating former autwelst:
 - elten Accentaitógus, der einen Verst das pulveribunique Materiale (DZ) ertbild, 4
 - einen Arzontudürper (120), der en dem Asservoint/organ beforchal lett, und date Asenveixòrem in sice Retallementations es 💆 drawn, wobei der Artriebeldsper omfont
 - ging Majoryaki von Acaptelanaryak in elvers obsess Darrich clarers.
 - CHARLEST SEE AND AND INCOME. de electro genteras fluvaleto comos until

us moyen forment builder de poudre in-Charit un corps de réservoir contanent une alimentation en matière en poudre à detriboar, lecht proven formert boltier de poudré included on outre tech conduit d'inhabition;

(A) ledi mayon d'alimentation comprend :

to corps d'averathement (120) firé audit compa de réservoir destant à président ledit. Hi corps de réservoir dens un sers de rotation, ledit come d'antrahement inchert este characté d'évidements dans ne partie PEDIFIEUR : CE

(b) ledt mayon deathé à transporter ledte quartité prédéterminée de lectile matière en couche inchest :

un mayon formani plaque de messare (180) - 🕬 destiné à contant une quantité mesurée de lacite ancière en poudre, lecti anayen formest plaque de masure incluent un PROVED ROTTORES STOM de doce messurée desthé à contonir lectra quantità massurée de 25 ladite regiliere en possitre, ladit moyen losment placue de mesure pouvert être placé eréign ne nobstrantis etibal auceseb-se on poudre, et ledit mayon formant plaque do mesure et helt moyen formatt builder 30 de poudre pouvent lourour de manière bidirectionnelle l'un par reppet à l'autre eutour d'un esse curstral commun de taçon des ladt gegren forment trou de does mêessie suisse être piacé edectivement en 25 communication fluids avec techs affinentstion en mutière en poudre ou avec lecit conduit d'inhebition :

(c) un mayon forment ressort (290) reppetent. 48 fun vers fautre leck moyen formers plaque de mouse et lect mayen lument bobler de poudre ; et

(d) ledt moyen formerst buse étans morté eur tedi corps d'antrainement pour recevoir lacits 4 quantité massain de lacte matère en pourre per l'intermédiaire dudit conduit d'inhabition, ledi mojen formet base inchent des mojens fotoeri perveres scutie dese leutis éxischards dutill poppe d'entrebrement.

19. Inheleteur de poudre ealon la revendication 9, caexcluring per to talk que tech corpe d'entraframent. composte une perei expérieure, et laccita àvidements sont agencée le long d'une partie périphérique de lada parci supérieura.

11, brhalateur de peudre ealen la revendeaden 10, ca-

une configuration circulaire, at feedita évidements sort sources scheep un carcle commun dans tacks partie phriphérique de laçõe parti expérieure circu-

- 12. Inhabateur de pouche selon le revendication 0, cacactérios par le full qu'au cocine fun danctis évidements s'étand our une longueur d'Étreste par rapport à un autre descite évidements, et fescile maryone formers converses ont due longueure conveponders à celhe respectives duscits évidaments.
- 13. Inhabiteur de poudre auton le revendication 8, caractifité per le fait que lecit moyen formant pervare di lucit corps d'entrafrement aont constitués distribution plactique, et landits moyens formant nurvares sort soudés per altrasque dans leadits évidements duck corps d'antischement, de façon que la metilire plactique deedits moyens formant norvares and fundaments are: In mediate plantings deadly defdedeath.
- 14. Inhainteur de poudre malon le revendication 9, cacactérios por la Init que ;

ledit come d'entraînement contraend au moins to beforest d'estratatement pourve d'un doice de ressort (163) dans chaque évidement festationes :

us administrar est monté immubile en mixion per rapport aucil mayon formeré pluque de meeuro, fedit adaptathor lectuare au moire un évidement de vercuillace declhé à y recevoir ladit au moins un doigt de ressort pour empêcher ta rocicion dudit moyen forment bufiller de pouthe pay report and administrative of and mayor forment pieces de massers : at

techt choyen forment couvercie de fermeture inchil un mojen d'amorçage destiné à bire tourner lech moyen tomant bolber de poudre, de facon que la discondut d'Ivitaticion soit en comexplication even lack region formest trou de dose mesurie, lorsque lech recyen formant couvercle de fermeture s'est plue dans lectio Chocalion de recouvement ducit moves forment boltier de poudre, et à faire tourner lecit moyet fotment bullier de poudre de façon que into control of chaladion coll hors to communication muse incit tocasa instructs trees do done mesures toracus ledt moven formest consercle de fermeture est fixé dess une disposition de recoverement auch moyen forment boltier de pacitie, ledit mayon d'amorçage incluent au mains une nervure d'emorphye destinée à reppaler lacit as moins un doigt de researt à feudefeur ducit au moire un évidement de vermultippe decil adaptateur pour pennetire la se-

Revendentings

1. Inhabitaur de poudre, comprenent :

un thoyen de base depliné à supporter des COTTONE !

SOCI mit der teneren Obertäche der åu-

Beren Wand gagessen let, con die Klinke

In Engist out des Zühnes des kontinuier-

lichem Zifeberings and this intermellieren-

radialen Richtung ambrucks.

den Zählentings zu drücken, webei die Klin-

relative aich entlang einer elligemeinen

un moyen d'alimentation ductivé à contamis une elimentation en matière en passare à clistribuer ; un conduit d'inheistion d'étandant dans une oracións direction el placé dans una disposi-Dan especie ducit moyen d'altrastation ; un myet deché à tansporter une quantité précisemente de ledis matière qui poudre de-

di mayon d'alimentation audit condut

talles de particules d'actionérate de matière en poude; à partir du canduit d'inhaistion pour fonner une muclère en poudre ayest une table de l'ordre du micros et dectiné à miliançar lades matière en poutre de taille de fentre de 🕬 ericron even de Pair d'expiration ; tedit moyen forment buse inclosed;

un moyen formazz cavés destiné à chanow de lectre première direction durit condust d'inhetzine vers une seconde direction (Sthesis de tada prentere direction, ledit moyen formert cares stant defini per une parti supérious et une jupe refée à une ... párithérie de fudio puroi expérieure, fadite peral expérieure possidant une

un meyen de formation de touchillen desties à faire veries estrablement de stranière . 49 continue in direction d'éconémient de ladite pouche dess lucita exconde direction dans lack moves forment cavité; et

un moyen bornesi cheminée, s'étandaré do lactro parel expérieure dans une dispeatton d'antourage par rapport à facte enverture, destiné à modifier le direction d'accidement de lacitie poudre de facilie seconde direction delli moyen formeni cavità earablement on retour vers leafte premitieto direction, facilitativan formant charcings grandant dans as direction gatate; at no moyes formari couvercie de termeture

continé à courté lucit groves d'admontanea at lacti moreo formest buse .

caractérios per le talt que leçà moyen losmars chaminée inclut une austrice de paroi subultaire echiacre comportant das informatios s'étandent desg tades drection axials.

2. Inhelicius de peudre selon la revendicadon 1, cacactifrisé par le fait que lestitue inégaterble sont formées par one pluralité de connetures qui factio centació de painti bibulaire interne.

1 Etheteses de poudre ealon la revendication 2, casectórios per le fait que leedine canneluses sont bondes out :

> une pluralité de premières sections de persi conceve s'étandant dans faciles direction exércis et ayast un era d'un premier rayon dans une direction transversale à lacks direction axiale.

une parallé de secondes sectore de parel anabiles to effects noticed anabile at relicion mutualement quickes premières sections de naci concert.

4. Education de poudre selos la revendication 3, caractifică par la fult que lescites secondes sections de parol est une configuration conceve ayant un art; d'un escond reyon dans une direction transversale à lacite direction active, lecti excensi rayon dans aupádeur esult premier rayon.

la direction d'écoulement de lacte poudre - # 1. Inhabiteur de poudre selon la revendoction 1, caractifică per le fall que lacite perti expérieure a une forme circulaire of facile operature and utude au cardro do lacito parol expérieure, et par le tait que ledit mayon de formation de trestifion éschal une parei incurrée s'élandant de leulle euverture à lacine issue.

> 6. Intelligeur de poudre selon le revendication 6, carectéries par le fait que feche peroi incurvée arbitant d'una macière constituement en apirale.

7. Inhaintaur de poudre selon le revendoption 5, carectificad per la fail que lacia perol facurado est cellée à lucita paroi expédiente.

6. Inheisteur de poudre enfon la revendication 1, caractidad per le tait que lecit moyen formant checrande a un que certral et lecle conduit d'inheletion à un amperator parallèle à, et décalé de, l'emposetrai ducil croyes formant cheminée.

6. Introducer de poudre selon la revendication 1, caractéctué per le fait que :

47 EP 0 883 415 B1

prime duck marrie formest ballier de paudre per repport excit moyes formest plaque de tréeuro et pour ereneur facil au moins un évidement d'extrahement pour faire tourner lecti mouse femant hottler de coudre per raccori. . audit moyen intrast plaque de mesure.

18. Inhetiteur de positre selon la revendication 14, caractifelaé per la fait que ledit corpu d'entratnement freit deus doigts de resset derrétralement oppepés, lecit acoptimus jocks deux évictements du ver-Bace devidenteres eccesie, et par le fait que ledit expentement covercie inclut su moire duct narwess d'artorpage disredintalement oppo-

15, inhalpeur de poudre sebn la revendication 14, caconstitute year to talk one chappe nervice d'attonçaça inclut una partie inclinia expérieura et una vens gluns partis intermédiales de mallis et arriteclimant à grapare carbina s'élocopat de lacte partie en palle, de sarte que indite perte inclinée exphilosop records incidentall local au moine on doigt do masort have doubt au maine un delcharant. 45 do versualiza penderi la restili ducit enzyan farmart couracte de fametate de facile discoulfres de recoverament, de que inclus pertin inclinée infécleure reposte intestement ledit se male un daigt de remort hors dutin as mices as felderant do ver- 🛲 readings particles in feature ducit, proper females consulatio de lacoletina data lacita disposition de

17. Inhabitar de coudra salos la sevendostico (S. Ch. 20 ractifiché par la talt que chaçue dit Colgi de spaciel (1833) inclut on cross qui seçoit techts portes on ealfie langue tedit mayer fearest convento de formation est complétement dué deux botts disposition de re-

18. Introductor de pouche seba la revendication 14, cacontaining pay by that oper built compo d'accombinament inche deut delchenen d'annément den innie कावार प्रदूषकार्थक का प्रस्ता कार्युक्त का मान्युक्त में विकास करें à l'attitus dinde des édouvers d'artifié-CORES COMO UN ÉCUS CON RECORDA.

19. Ethilizaur de possée entre la revendantino 14, coractivisé per le tait que:

> fects extensions includ an analyse are chancely the come hélecies apar una configuration en sacilità i amanazzia sorabiente i carrie ; el tech mayon typicani connecto de formatica 😅 25, ichatator de perche artico la revendication 22, coed4:

em jobe appointed and action

au moine une came formée sur une pertie intérieure de la surtace intérieure de la jupe and enforce set (that environ serior set) church de came hélicoldal.

\$0. Inhabituar de positiva estas la resendicazion 19. ca ractérisé par le tait que chaque dit chamb de ceme inclui time pertie d'embée définissant une zone de descente verticale dess lequelle lutile en extint une carrie engage anext de permative sin déplacepropri háliculdad do India ao croina una carne à l'intibles ducit ou mains un chamin de carre.

19 21. Inhabitour de poudre selon la revendoction 18, cacusticisé per le fait qu'il comprend deux desdits charatra de cama billiculdanz al daux danditas ca-

partie inclinée intérieure qui en rencontreré aux ré- 🕬 22, lobabitaur de poutre enfon la revendicadien 9, capagnished paor to that gase :

> facilitativan formati plaque de masure compoto un côté inférieur portact des noverne : en mayen de contenence permêntie en gez est potest pour contante una deas de techte tradière en poudre dans ledt moyen formatt treu de depe consumée, fect chappen de continuènce ditant

place as-depose duck moyen formaré tres de

dose menurte : had storen de centerance est placé dans une discontinue de perconnecter à per recont au câthis institution ducit proyen formerst plaques do mesure of excellent curvates car's posts; et high stryen du contanacca est south assillat concerns the sector case bracking more state has

alcredes sinc lade copyes de conteneros.

23. bendataur die peuche selben is re-wederstein 22, caractorioù par le tait que lact mayon de contanasco est contribit efect multière choisie à partir du graups constitué d'un libre perméntée en grat, d'un tunis craffé, d'un coeffique de matière possone et gue décest formet plaque partorés.

24. establish de pesche auton la revendication 22, comedicinal part in that can lack covers on common CO OCE SCHOOL CON LINESCOOL RECURRENCE RESPECTABLE.

25, inhalateur die proudre auton in reversidentlein 22, coractifité par le ball que bacilles maraves sons constable s'une parallé de cardes concerni-

ractified par is fall quarthaque before à time configuration de section transversale senstáments Mangalake,

EP 0 883 415 81

34

27. Inhabiteur de poudre selon le revendoution 22, casactifiei per le full que ladia sissue de mesure at lech dispositif de matière permissie de gaz sont réalisés per les étapes, dans fesquales :

> on cinco inchi contameur permietrio ese cata il une position précéterminée dans un premie deni-moule utilinà pour moulege per injection de tadte plaque da masure;

co chica un second derri-mode educant sutil. premier developade pour former, entre est. une chambre de moutage utilisée pour moutage per injection de techte plaque de messure, lects second darri-moute possidant une mannture traversante alignée avec fedit contaveur 19 en nivere de lacite position préciteminée de-(2) premier derakmoute :

on introduit une pointe pour noyes à travers ladie constant terrements deelt meteral date moute an angagement ever hadt contineur # pour mairmair le conteneur en position contre hadi presider dertil-mode al pour former un title On draw throat the date facility plugged on measure

on injecto de la macière plactique dans lacito. El chambre de moutige à Stevers as mains un oiltice d'injection pour torreur lectre phaque de masore pourses ducit tros de dese messale. Incli contenue étant l'es à un côté intérieur de tacité ptaque de mesure dans une deposition de re-COMPARTMENT pay regiport exaît troy do done one-

25. Introduction de posicios entre la revendication 27, co-condition commonts up discharged past protect formal no checquis euro contrata interiore decension de Curtourage per rapport excit tree de dose mesrise, et lecif contament de poudre a des dimendons aspérieures sucili tros de dose mesurés pour cosver considerational lacif from the date measurée et lethrough such inclinated pay protect pay from the à lecta plaque de manure cana lecti évidement pou COTON SERVICE

25, brestates de passive selon le revendantion 9, cocactivité par le tait que lect projet de tame CHECKET :

> une base portant un ples de maintes s'étandest existerest coxial such con constant di refé creschir en rotation audit moven formest plaque de contre ; til

> us mayon formant compters mortifi excisit en ruction my hulls tame dans take disposition. If glandounique per rapport excel pinel de medicion, parvant à founds un compte véauel du sontiere Co Comma characterist, our restant à chimitaires, Co

ca cilbal à sencoin ne erbuoque en riponee à lacite rotation relative dudit moyen forment boltier de possive et ducit moyen formant clinque de maeuro, lack mayon forment compteur inchant :

es moves forment bacue de compteur des tind a loursir lack corrects visual, lack moyen formest begun de compteur poucompletion are the victor record to the cream et portunt des replicas de complage pour affichage duck compte visual, led? moyen formeré beque de comptieur between:

una bagua da comptato continua portant due repâres de comptage et des dacts d'engranage, fortnées autout de colle-ci, our en aurtico littérieure, et une bacue de constaur distortinos mostie condelement à lacte becue de complete continue et portant des replires de comptage et des dents d'expressos, families extrar de celleci, are an author institute.

un mayon d'adichège per lequel l'un deedle replese de comptens dud? moyenforment begue de compteur est click pour indicare un consta conrespondent à un sombre de donn die Stanion, as realist à distribus, de medère en poudre ; el

un moyen d'actionnement pour bile

Shall effection from the manual endingers on the state of moyen forment bagge de compteur en ettre evitates extentes estant à messagin high mayon forment phoque de mesure or high phones fractions and the proper the, but theyen d'actionneme class on mayor fastisest cliques engaguitt lexitus dests d'argranage de incite backes de conscient controle et de lectre began de comptes discustione pour tains tourner lactes bacaus de complete cardinal d'un resident à channe dell'indica d'une desse de conthe se paids pour afficher un nutre duadra moirres de comozação de facilita begue de comptes continue per l'eterrádisis dadi caren dallacara. et peur faire trascur leche bagus de complete depositions that expecà disque scribre prédésausés d'acolorests die explane die badle become On CONTRACT CONTRACT DESCRIPTION US. авте бинба періти се ситраци си ledio began do corquira discontinuo per framewideline duck cropes (fallchaps, but expen branch chapes

EP 0 883 415 B1

un doigt de réseart dans chaque dit évidement d'entrefrement ;

dans lequel ledit moyen de transport (190) comprend :

en moyen formant plaque de mesure (180) desties à cortanir une quantité mesurée de lactie inchère en poudre, lede moyen formant plaque de mesurée pour contenir ladite quantité mosurée de tarite matière en poudre, ledit moyen formant plaque de mesure pouvent être placé au-despois ledite elimentation en metière en poudre, et tedit moyen formant plaque de maaure et ledit moyen formant polities de poudre pouvent parmer fun par rapport à faistre de manière bidirectionnelle actour d'un axe central commun de sonte que ledit moyen formant trou de cione mesurée peut être placé aétectivement en communication fluide évec tedite atmenta-

tion en metière en poudre ou avec ledit conduit

sure comportant un côté bétérieur portant des

d'inhabition, lecti moyen formant plaque de me- 25

nervores;
un mayen de contenence perméable au gaz destiné à contenir une dose de ladite malière en poudre dans ladit moyen forment bou de dose mesurée, ledit moyen de contenence étant placé au-dessous dudit moyen forment trou de dose mesurée et dans une disposition de re-couvermore per rapport au côté intérieur dudit moyen formest plaque de mesure et aucoltes nervores qu'il porte, ledit moyen de contenence étant soude aucoltes nervores de sorte que les dises nervores ent fusionnées avec ledit moyen de contenence;

un moyen formant ressort (200) destiné à rappeter l'un vers l'autre fedit moyen formant plaque de mésure et ledit moyen formant bollier de pouche ;

dans lequel ledt moyer forment base est. 49 monté sur ledt corps d'entraînement et comprend en quire un moyen forment mentre soudé dans les-dip évidements chefit corps d'entraînement ; le disposité comprenent en outre ;

un adiptateur morté lemobile en autation per rapport socié moyen formant plaque de mesure, lecit adaptateur inclaseit.

as moirs un évidement de verroulitage destiné à y recevoir ledit au moirs un doigt de ressort pour emphérer une rotation dudit moyen formant boltier de poudre par rapport audit adaptateur et audit rouyen ferment plaque de mesure, et au moine un charde de came héficolitat syant une configuration de section transvernale execulturant currée;

dans lequel ledt moyen fazment couvertie de fermeture (SSS) act agencé pour amorcer ledit lehalataur de poudre pour atliauties, ledit moyen bemint couvertie de fermature inchant :

Un moyen d'amorçage destiné à tale leumer lacit mayen forment boltier de poudre de sorte que lecit condut d'inhelistion est en communi-CECION AVAC INSIL COMMO INSTITUTO DE COMO meants brague half moyen forment convencle de fermeture s'est plus dans la disposition de recouvrement per repport much mayon forment boltier de poudre, et à faire tourner ledit moyen forment boltler de poudre de aorte que lucii conduit d'inhelation est hora de communication area ledit moven frament trou de doue mesurie lasque indi mayon fortant convercle de fermature est fixé dans une disposition de recouvrement excit moyen formant belder de pouchs, ledit mayor d'amorçage àrchiant au rapina une nensure d'amorpage servant à rappeter feeft au moine un deigt de ressett hore dudit su moice un évidement de verradisce dudit Eliab rollation and estimated rood runtations moyen forment boliter de poudre per rapport audit moyen forment plaque de mesure, et è engagur evec ledit as moins un évidoment d'entraînement pour laire tourner lecit moyen formant boilder de poudre par rapport audit moven forment pleque de mesure :

une jupe annulaire comportant une surface interne; et

su moins une came formée sur une partie iniérieure de la surface intérieure de la jupe annuluire pour eulire lecti su moine un chartin de came hélicolidal;

dans lequal ledt moyen de base porte un pied de traintien d'étandant ariabement coasiel eudit aux coursess et relé immobile en sotation audit moyen formant phaque de mesure, ledit déposité comprement en cutre :

un moyen forment comptent, monté mobile en rotation sur lacite base dans une disposition d'artiturage par rapport audit pied de mainties, destiné fournir un compte visuel du nombre de doese distribuées, ou restant à distribuer, de ledite matière un pouche, un réponse à fadite nitation relative dudit moyen forment boltier de pouche et dudit moyen forment plaque de meaure, lecit moyen forment compteur inclusert :

UNA parti mphriagra comporters talla surface estàricura et una sur-

tace instrume,

un ciquet, moulé d'un seul tonent, en tant que pièce unique, avec le auriace extrinure de ludite parci extérieure, pour érapiquentel avec les dents d'angremage de l'une de ladis baque de compteur continue et de ladis baque de compteur decentinue, et un resent de cilquet, moulé d'un écul lesent, en tant que pièce unique, evec le surface intérieure de

un recent de ciquet, mouté d'un seul lengrit, en trat que pièce unique, evec le surface implieure de leche purei extérieure, pour repparei lecit ciquet en engagement evec lescrites dents d'engrenage de lecits beque de compteur controu et de lecits beque de compteur de compteur descritifius, lecit ressont de ciquet s'illuridant suivest une direction giobalement radiate.

- 30, interior de poudre esten la revendication 29, ceractifiché par le fait que ledit ressort de cliquet e une conformation globellement en L.
- 31. Inheliateur de poudre selon la revendication 29, cepartificié par le fait que ledit ressort de cliquet e une configuration globalement linéaire et s'éland à un certain angle par repport à la surface intérieure de façite peroi extérieure.
- 32. Inhelicteur de poudre enlos la revendication 29, caractérisé par la tail que ledi sessoit de cilquet comporte une extrâmbé moutée d'un seué tenunt evec une partie aspérieure de tadite surface intérieure de lacite parei extérieure.
- 23. Estabatur de poudre seion le revendication 29, caractificé par le fait que loudine donts d'angrenage de ledie beque de compleur confinee sont àguncies en correspondance evec leedie repires de comptage qu'elle porte, et leedies dents d'angranage de ladhe beque de compteur discontinue euré egencièse en correspondance evec leedies repires de comptage qu'elle porte.
- 34, teheligieur de poudre selon la revendication 29, caractioné par la fait que les dents d'engranage de ladite begue de compteur continue lactueré une pluratité de premières dants d'engranage excossières d'une première protocéser et su males une deuxièone dont d'angranage d'une dessières protondeur expérieure, chaque dits deuxières dent d'angranage étant placée après chaque nombre préditermi-

né dundes presières desta d'angranage ; el lacino bague de compteur d'accenteue inclui une plurable de projuières dente d'angranage auccessives de projudeur égale à la projundeur de chaque dite douzitme dant d'angranage de lacite beque de compteur continue, de aorte que ladé cliquel angage celles, auccessives, describe premières dente d'angranage au cours d'apécations de douage aucessives et angage une dite describme dent d'angranage et une traisième dent d'angranage de lacite beque de compteur discontinue après une pluralité d'apécations de donage.

25. Introduteur de poudre selon la revendication 29, ca-

72

ractistal per le talt que lecit moyen d'actionnement inclut en outre un moyen d'entraînement de cliquet pour rotation incrémentiule ducit moyen foreners cilques, lects moyen d'entrethoment de cilques inclueré un disposité de mainten monté mobile en rotation aux incite base, concisiement à facite baque de compteur continue et à fadite begue de compteur discontinue, ledit dispostil de maintien itchunt un premier moyen d'entraînement de cliquet dectiné à engager un côté ducit moyen formers câqual pour faire tourner de manière incrémentielle ted) mayon forment oliques dans un premier sons de rotation au bout de la rotation dudit dispositif de mainthea dans ladi premier sems de rotation et ta second mayon d'antraînement de cliquet destiné à engager un cità apposé duali moyen formeré ciquel pour faire tourner de manière incrémentielle lack moyen locment cliquet dans un second sens de rotation opposé au bout de la rotation ducit contanaur dans lock second sans opposé de rotation.

38. Inheisteur de pouzes ealon la revendication 28, cosectérie par le fait que lestitz repères sont orientés dans une direction actale aucit inheisteur de laçon à pouvoir itre lestita répères lorsque l'exhalisteur est crienté verticalement.

27, bihatzour de poudre acton la revendication 1, comprehect:

un moyen forment bottler de poudre (20) leclusmi lecit moyen d'alimentation (20) et lecit concluit d'inhalistion (50), lecit moyen forment bottler de poudre compresson en cutre :

> un carps de réservoir inclusirs une alimentation en matière en poudre (82) et un corps d'extrainement (120) fixé audit corps de réservoir pour entraîner ledit corps de réservoir dans un sens de rotation, ledit corps d'entraînement inclusirs;

> > one pluralité d'évidements dans sa partie supérioure ;

75 EP 0 \$33 415 B1

en moyen tomaint bague de compteur destiné à tournir ladit compte vieuel, ladit moyen forment bague de compteur posveré tourner eutour dudit eue central commun et portent des repères de compteur pour effichage dudit compte vieuel, ladit moyen forment bague de compteur lochant;

use baque de compteur continue posterá das repires de comptage el cina deste d'arquesque tomèce, autour de celle-ci, ser se aertace intérneure, el une baque de compteur decordinue montée condistement à todite baque de compteur continue et portent des repères de comptage et des deste d'arquesage, formése autour de celleci, qui se autoce ettéreure;

un moyer d'affichage par lequel from desdits repères de comptage dudit muyer luminatibaque de compteur est affiché pour indiquer un compte consupordent à un nombre de doues disvibules, ou mutiest à distributer, de 25 matière en poudre ; et

un moyen d'actionnement destiné à

titre traumer de mendère incrémentale le lectionnyen formaré begane de compteur en réponse à tache rotation retail se entre lecti moyen formaré plaque de mesure et lecti moyen formaré politer de pessons, lecti moyen formaré chiquel expeganet seus lections destinate de compteur expeganet seus lections destroyant destinate des lections de compteur confinant et de lactio begane de

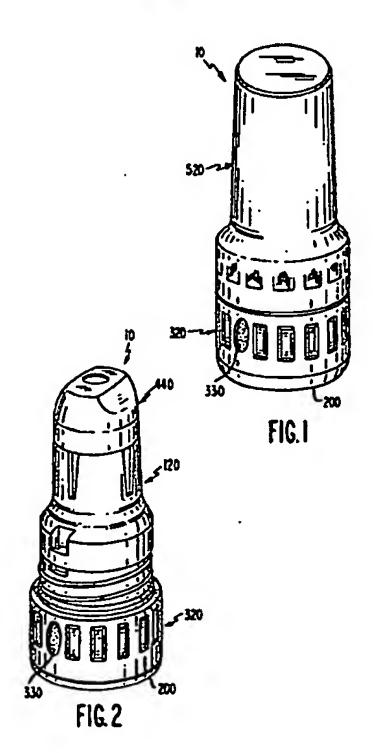
compleier discontinue poor taine toutner trickle begun de compleier continue dus intrépeed à chieque distriction. 46 dune desse de cedities an poudre pour alligher un more desdits replane de complage de tedite traque de compteur continue per l'ensemblaire ducié droyen d'allignage, et pour tribe tourner tuble bugue de complete discontione d'un jourément à Chaque sombre

con parci estàtaura composant una sociaca estàtacara di una surtaca interiora, 71

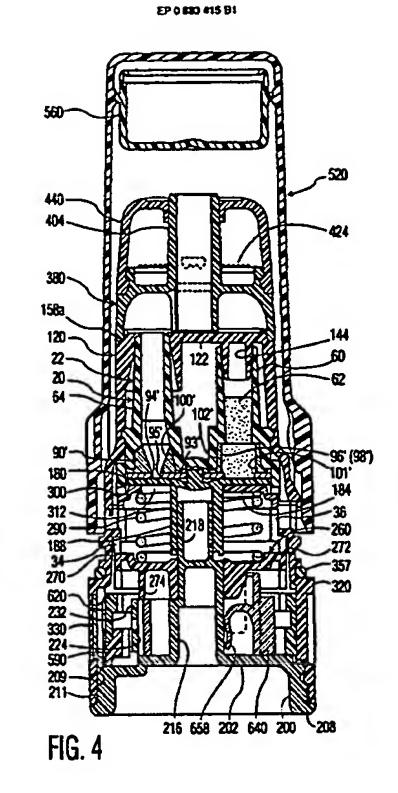
un ciqual, moulé d'un seul terant, an tert que plice unique, avec la autace extérieure de ledire paroi extérieure, pour engagement auez les dants d'angranage de funs de ledire baque de compteur continue et de ledire baque de compteur discortinue,

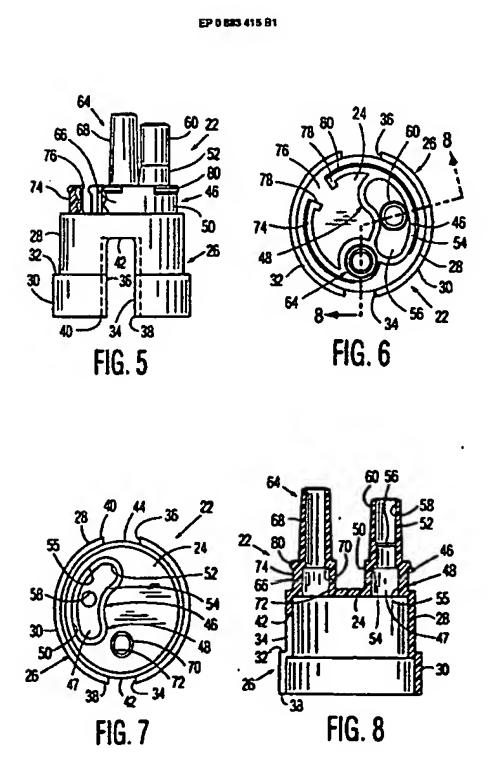
compleur decortines, un resent de chiquet, mouté d'un seul tanent, en tant que plèce unique, avec la surface brâtrisure de ledie parci extérieure, doctiné à
reppaier ledit retyren formant ciquet en engagement evec lessifies dents d'exprenque de tadits beque decompteur conditue et de ledits beque de compteur d'econòrue, ledit resent de cliquet d'étanquet rachele.

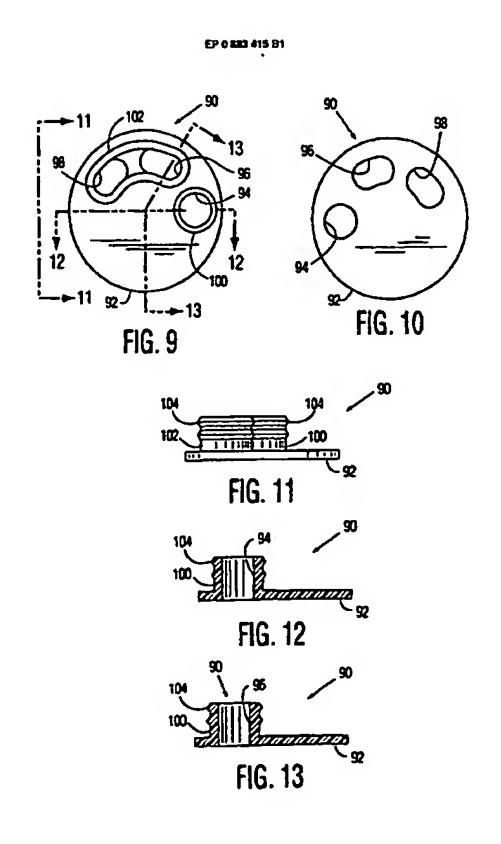
EP 0 883 415 B1

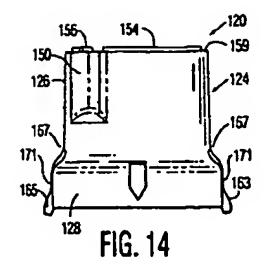


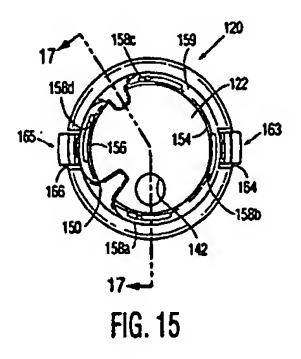
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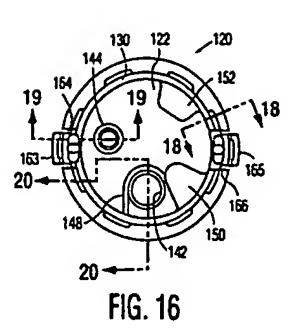


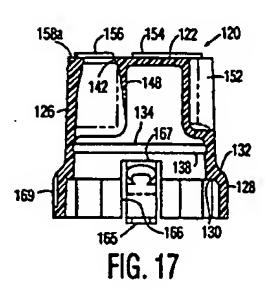




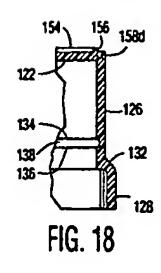


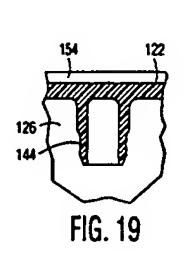


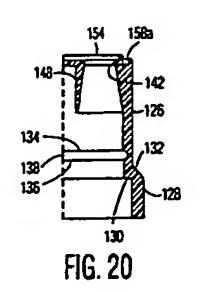


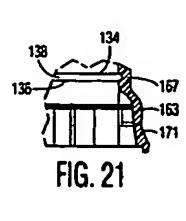


EP 0 683 415 B1

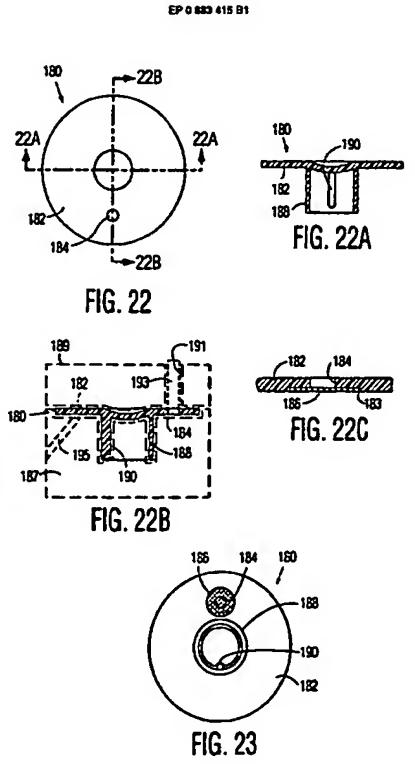




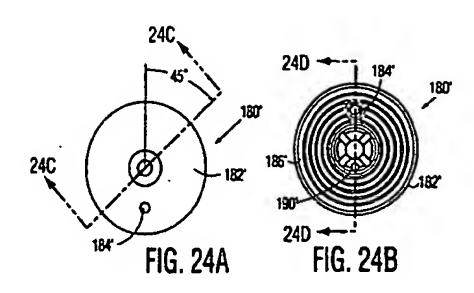


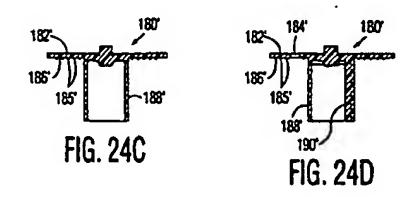


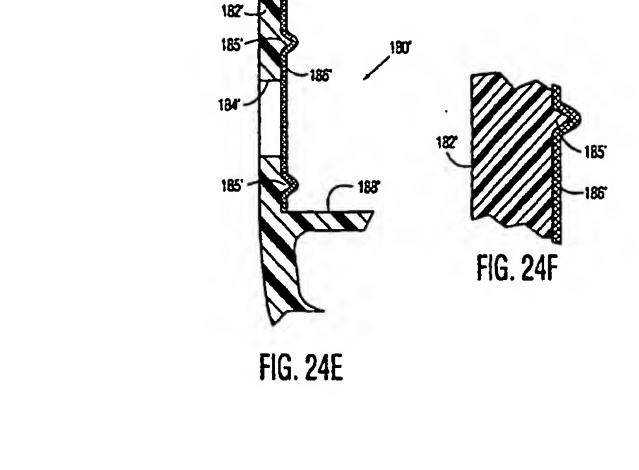
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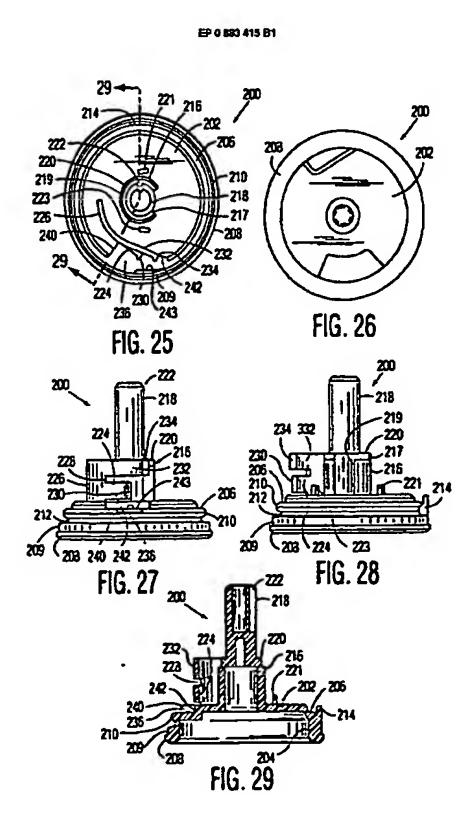


EP 0 833 415 B1

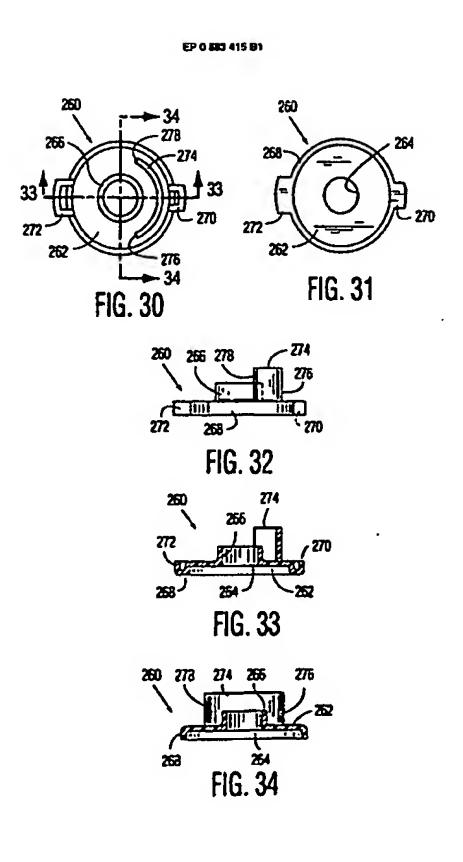




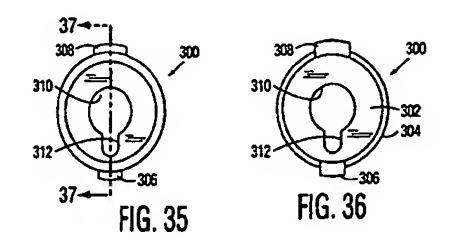


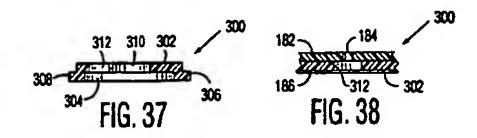


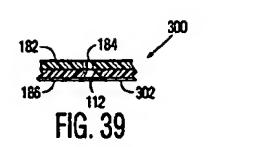
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EP 0 883 415 B1

